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Coos Bay District Resource Management Plan and Environmental Impact Statement

Volume II

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Appendix I-A
Legal Guidelines

The following statutes and executive orders (as amended) constitute the major legal guidance for planning and management of lands administered by BLM in western Oregon. This list is not necessarily all inclusive but does represent the primary legal guidance to be considered in preparation of the Resource Management Plan.

Federal Land Policy and Management Act of 1976 (FLPMA)
43 USC 1701
The O&C Sustained Yield Act of 1937
43 USC 1181a
National Environmental Policy Act of 1969 (NEPA)
42 USC 4321
Environmental Quality Improvement Act of 1970
42 USC 4371
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)
Taylor Grazing Act
43 USC 315
Recreation and Public Purposes Act
43 USC 869
Unlawful Inclosures or Occupancy Act
43 USC 1061
Mining and Minerals Policy Act of 1970
30 USC 21a
Mining Act of 1872
30 USC 26
Mineral Leasing Act of 1920 (Mineral Lands Leasing Act)
30 USC 181
Materials Act of 1947
30 USC 601
Geothermal Steam Act of 1970
30 USC 1001
Geothermal Energy Act of 1980
30 USC 1501
Antiquities Act of 1906
16 USC 431
Historic Sites, Buildings, and Antiquities Act
16 USC 461
National Historic Preservation Act
16 USC 470
Archaeological Resources Protection Act of 1979
16 USC 470aa
Reservoir Salvage Act of 1960
16 USC 580m-n
Fish and Wildlife Coordination Act
16 USC 661
Bald Eagle Protection Act
16 USC 668
Sikes Act
16 USC 670a
Migratory Bird Treaty Act
16 USC 703
Migratory Bird Conservation Act

16 USC 715
Wilderness Act
16 USC 1131
National Trail Systems Act
16 USC 1241
Wild and Scenic Rivers Act
16 USC 1271
Executive Order 11644, Use of Off-Road Vehicles on the Public Lands (1972)
Executive Order 11989, Off-Road Vehicles on Public Lands (1977)
Wild Free-Roaming Horses and Burros Act
16 USC 1331
Coastal Zone Management Act of 1972
16 USC 1451
Endangered Species Act of 1973
16 USC 1531
Soil and Water Resources Conservation Act of 1977
16 USC 2001
Executive Order 11988, Floodplain Management (1977)
Executive Order 11990, Protection of Wetlands (1977)
Coastal Barriers Resources Act
16 USC 3501
Land and Water Conservation Fund Act of 1965
16 USC 4601-4
Federal Water Pollution Control Act/Clean Water Act
33 USC 1251
Safe Drinking Water Act
42 USC 300 (f)
American Indian Religious Freedom Act
42 USC 1996
Resource Conservation and Recovery Act of 1976
42 USC 6901
Clean Air Act
42 USC 7401
Comprehensive Environmental Response, Compensation and Liability Act of 1980
42 USC 9601
Emergency Planning and Community Right-to-Know Act of 1986
42 USC 11001

occupation unless the occupant or resident gives his consent in writing. Commercial products will not be applied within 100 feet of any croplands or by helicopter within 100 feet of any surface waters or identified ground water recharge area. Nor will the commercial products be applied by ground vehicles equipped with boom sprayers within 25 feet of any waters. Spot treatments with vehicle-mounted handguns or with backpacks will not be applied within 10 feet of water. Herbicides will be wiped on individual plants up to the current water line and will be applied by helicopters only when wind velocity does not exceed 5 miles per hour. Wind speeds may not exceed 8 miles per hour under any other herbicide application method.

Certain restrictions also govern the equipment used to apply the formulations. Spray nozzles on all helicopters and ground vehicles must be set to produce spray droplets with a median diameter of 200 microns or larger. Helicopter and ground vehicle equipment must also operate with a boom pressure of 20-35 pounds per square inch, unless the herbicide's label specifies a different pressure. Aerial applications must be within 100 feet of the ground. Backpack applications of liquid formulations will be allowed only with low nozzle pressure and within 2.5 feet of the ground. Granular formulations will be applied by broadcast spreaders only within 3.5 feet of the ground.

One final set of restrictions governs the maximum amount of the herbicides in each of the commercial products that may be applied. The FEIS, as modified by the SEIS, includes a table showing the maximum rates of application. BLM's proposal was to apply dicamba at 6 pounds per acre, glyphosate at 3 pounds per acre, picloram at I pound per acre, and 2,4-D at 3 pounds per acre. If, however, small animals susceptible to dicamba or 2,4-D are on the site to be treated and represent sensitive wildlife species in the area, BLM will not use these substances if glyphosate or picloram can be used instead. Or, if that is not possible, BLM will substantially reduce the amount of dicamba or 2,4-D to be applied per application. In addition, BLM ordinarily will apply the commercial products only once a year to any site and, except under circumstances where control or eradication goals are not achieved, no more than three times during the program's span.

The provisions governing BLM's use of herbicides in this program require measures to mitigate possible environmental effects. More mitigation measures are included in the FEIS, the SEIS, and the policy statements and manuals they cite. All are incorporated by reference into this supplemental record of decision. The purpose of the mitigation measures is to ensure the judicious use of the herbicides.

BLM projects that it will annually use the herbicide formulations to control or eradicate noxious weeds on about 21,300 acres of the public lands in the Northwest: 7,800 acres in Idaho, 5,600 acres in Montana, 6,600 acres in Oregon and Washington, and 1,300 acres in Wyoming.

BLM will treat public lands infested or potentially threatened by noxious weeds according to a set of priorities, which are detailed in the SEIS, page 119. The priorities represent BLM's commitment to pursue all existing methods for controlling or eradicating noxious weeds, including the use of herbicide formulations, with no undue reliance on any one means. The priorities detailed in the SEIS are part of this decision.

The following is verbatim from the original Record of Decision of April 7, 1986. (The remainder of the Record of Decision is incorporated by reference):

Management Emphasis

To give definition to the integrated management called for by this decision, the Bureau also shall treat public lands infested or potentially threatened by noxious weeds according to a set of priorities. The priorities are three-fold: (1) prevention, i.e., stopping noxious weed species from being introduced onto public lands; (2) eradication, i.e., halting the spread of noxious weeds by eradicating invading noxious weeds; and (3) control, i.e., limiting well established infestations competing with desired vegetation. The remaining program direction on setting priorities for treatment largely represents a paraphrase of the consensus reached in Idaho between the BLM State Office there and affected interests.

Priority I and II - prevention and eradication of new invaders. Prevention is often the most practical means of controlling noxious weeds. This priority shall be accomplished in part by educating public land users, and where possible, conditioning their use in a way that improves the chances that new weed seeds are not

Appendix I-B
Portions of *Record of Decision Northwest Area Noxious Weed Control Program*

The following is excerpted verbatim from the *Supplemental Record of Decision, Northwest Area Noxious Weed Control Program* of May 5, 1987. (The remainder of the Supplemental Record of Decision, including the Rationale, is incorporated by reference):

The Decision and Its Specific Provisions

To control or eradicate noxious weeds, BLM will use six commercial products containing herbicides: Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4. These formulations contain different herbicides designed to kill or retard the growth of noxious weeds: dicamba in Banvel; glyphosate in Rodeo; picloram in Tordon 22K and Tordon 2K; and 2,4-D in Esteron 99 and DMA-4.

BLM will use the herbicide formulations as part of its ongoing program for controlling or eradicating noxious weeds. BLM has been using three methods. If noxious weeds are susceptible to insects, pathogens, or grazing by goats or sheep, BLM may introduce those biological agents to retard weed growth. BLM may also use laborers to manually remove noxious weeds and apply mechanical treatment—burning, mowing, and tilling. With this record of decision, BLM may use the herbicide formulations as a fourth technique. BLM will not use products containing dicamba, glyphosate, picloram, and 2,4-D on public lands administered by its Oregon State Office until the court dissolves its injunction in *Northwest Coalition for Alternatives to Pesticides v. Block et al.*, No 83-6272-E (D. Ore. 1984).

The provisions governing the use of Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 to control or eradicate noxious weeds parallels the features stated under Alternative I in the FEIS, Chapter I; the SEIS, Appendix I; and BLM policy statements and manuals referred to in those documents. The word "parallels" is used because the decision in several instances differs from the original proposal by requiring the more judicious use of the substances to avoid or minimize environmental effects of their use.

BLM will apply Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 only in accordance with the standards that the Environmental Protection Agency (EPA) imposes upon their public use. These standards are stated on the product labels.

BLM will use the commercial products only if the noxious weeds targeted for treatment are susceptible or highly susceptible to their herbicides. What this means is that the commercial products' herbicides, with one treatment, can retard at least 85 percent of the growth of the targeted noxious weeds. BLM will not use herbicide formulations if another method is more effective.

The herbicide formulations may be applied by helicopter; by ground vehicles equipped with boom or handgun sprayers; or by workers with backpack sprayers, broadcast cyclone sprayers, or tools for hand wiping the substances onto the plants.

Ordinarily, two considerations govern the choice of method. The choice first depends upon the treatment objective, topography of the treatment area, expected costs, and equipment limitations. The second consideration is the selectivity of the herbicides. Since Rodeo, which contains glyphosate, is not selective in the plants it kills or retards, it may be applied only from the ground to the noxious weeds targeted for treatment. And because the other herbicide formulations are toxic to conifer seedlings, the same restriction applies to how these herbicides are applied if conifers are being grown as commercial timber on the site to be treated. The restriction does not apply once the conifer seedlings become dormant, usually in the late summer. Unless conifers are present, the herbicides in Banvel (dicamba), Tordon 22K and Tordon 2K (picloram), and Esteron 99 and DMA-4 (2,4-D) may be applied by any method.

In applying the herbicide formulations, BLM will also abide by the following measures to reduce environmental impacts. None of the products may be applied within 500 feet of any residence or other place of human carried onto public lands. The agency's first treatment priority shall be stopping a given species from contaminating an area. More concretely, priority in treatment shall be given to those areas that noxious weeds have newly invaded. Eradicating new invaders shall have highest priority in treatment and funding.

Priority III - control. Weed species in this treatment priority are those that have become so established that for all practical purposes eradication is not feasible. Under this priority, noxious weeds will be treated for the purpose of reducing the population to a level that restores an area's ecological balance and productivity. The amount of control must be balanced between the costs involved and the prospect for success. Components of this category include: (1) emphasis will be placed on containing and preventing further spread of the infestation; (2) highest priority will be given to "breakouts" from the infested area and along rights-of-way or adjacent to private property; and (3) biological agents, when and where available, will be emphasized on main infestations when the agent demonstrates practical effectiveness against the weed.

Program Design Features

To give further definition to the Bureau's program, and recognizing that the available techniques carry different costs, efficiencies and environmental risks, the decision adopts the program design features from the EIS (Appendix I and Chapter 1) for deciding upon and governing use of a particular technique. In stating the design features, the agency does so to make personnel charged with implementing the program aware of the concerns and constraints about using different means. The design features are to strengthen and supplement the judgement of qualified agency professionals who have on-the-ground knowledge and familiarity with local conditions and needs.

Four chemicals are authorized for use under this decision. They are 2,4-D, picloram, dicamba, and glyphosate. Other or new herbicides could be proposed for use in the future, but before their use, all required environmental analysis, including a hazard assessment similar to that in Appendix K of the EIS, will be conducted and appropriately documented.

The Bureau will use the herbicide to which the targeted weed species is most susceptible and will be of least detriment to non-target vegetation.

The chemicals may be applied individually or in combination. Glyphosate, picloram, dicamba and 2,4-D will be applied only when in accordance with the Environmental Protection Agency's label and registration restrictions. All safety requirements and project features described in Appendix I of the EIS will be followed. All application methods may be used for each herbicide except glyphosate; it will not be applied aerially.

Conditions indicating preference for a particular method of application are as follows:

- Applications using backpack spraying, hand wiping and cyclone broadcast spreading (granular formulations only) will be used in areas not accessible by ground vehicles. Treatment area will generally range in size from individual plants to a few acres.
- Applications using a vehicle mounted boom or handgun will be used in areas readily accessible by vehicle. Booms are used to treat continuous weed concentration areas (i.e., along rights-of-way) while handguns are used to treat concentrated spots.
- Aerial applications will be accomplished using helicopters to treat larger contiguous areas, but normally not exceeding 100 acres in size.

Minimum buffer strips will meet or exceed state-mandated standards for all herbicides applied.

- In aerial applications, a 500-foot unsprayed buffer strip will be left next to inhabited dwellings unless waived in writing by the resident. A buffer strip of 100 feet will be left next to cropland and barns.
- Boom sprayers will not be used within 25 feet of water bodies.

- Granular formulations will be applied no closer than 10 feet from the high water line of streams and other water bodies.

- Contact systemic herbicides wiped on individual plants may be used up to the existing high water line.

Wind velocities for chemical applications of herbicides must be 10 mph or less in all instances. Where aerial applications of liquid herbicides are utilized, the wind speed must be 5 mph or less. Where vehicle and hand applications of herbicides are used, the wind velocity must be 8 mph or less except in riparian areas where the wind speed must be 5 mph or less.

Spray nozzles are designed for aerial and ground vehicles spray equipment to produce droplets large enough (200 microns or larger) in order to limit the amount of drift. Aerial application equipment will normally operate with a boom pressure of 20 to 35 pounds per square inch, unless the product label specifies a different pressure. Backpack application of liquid herbicide will occur with low nozzle pressure and within 2.5 feet of the ground surface. Applications of granular formulations through use of broadcast spreaders occur from about 3.5 feet above the ground.

Four major methods of manual and mechanical control are authorized for use under this decision. These are hand pulling and using hand tools, tillage, mowing and controlled burning.

- Hand pulling and using hand tools to remove noxious weeds may be used when no other means is available to control or eradicate the targeted noxious weed.

- Tillage, either by burial or disturbing the root system, to control or eradicate noxious weeds may be used under these circumstances:

    - slope does not exceed 10 percent.

    - nontarget species adversely affected represent an insubstantial amount of vegetation cover or forage for wildlife.

- Mowing may be used to control or eradicate noxious weeds under these circumstances:

    - The targeted noxious weed lacks rosettes or rhizomes and fails to produce seed heads close to the ground.

    - The targeted noxious weed is easily accessible by vehicles.

- Controlled burning may be used to control or eradicate noxious weeds under these circumstances:

    - The targeted noxious weed represents the vast majority of plants in the treatment area.

    - The burn is in accordance with BLM's Fire Management Policy (BLM Manual 9210).

    - The burned area can be rehabilitated to prevent erosion and resource degredation.

    - Burning permit, when required, must be obtained.

Biological agents will be considered for use where they have demonstrated practical effectiveness in controlling the target noxious weed species. This does not preclude the use of biological agents from an experimental standpoint.

Each biological agent must be cleared for use on the targeted noxious weed as required under Executive Order No. 11987 (May 24, 1977). The following conditions are the most favorable for successful biological control.

- The biological agent is highly selective and will only affect the weed species intended for control.

- The mobility of the biological agent is sufficient to allow spread among the targeted weed community.
- The development of populations of biological parasites should be able to overtake the population of the target weed species.
- Biological agents used in a particular area or region of the targeted noxious weed should be able to adapt and be capable of surviving and reproducing.

Mitigation Measures

A number of mitigating measures which exceed standard BLM requirements, have been identified in the Environmental Impact Statement and are adopted by this Record of Decision. The program design features just announced also can be thought of as mitigating measures. In addition to the measures governing chemical treatments announced in the project design feature section here and the EIS, the following provisions also apply.

1. Due to the low no observable effect level (NOEL) for reproductive effects from Dicamba, female applicators will be restricted from working with Dicamba.
2. Due to the lowered margin of safety for the mixer loader from accidents, the mixer loader will wear a full length apron, face shield, rubber gloves, and liquid repellant footwear during the mixing and loading operation.
3. To prevent gross errors in the field in mixing, regular testing on field calibration and calculation will take place.
4. Due to the remote nature of the treatment areas, sufficient clean water will be available on the sprayer mixing and project sites to assure the opportunity for workers to wash off any chemicals splashed inadvertently onto skin.

To reiterate, all chemicals will be applied only in accordance with EPA standards specified on the herbicide's label.

Monitoring and Studies

Table 1 summarizes the major monitoring activities which will be conducted under the decision. The purpose of the monitoring plan is to ensure that implementation occurs as planned and to ascertain the effectiveness of project design features and mitigation measures in meeting planned objectives. Information gained from monitoring will also be used to develop an improved data base from which to build future plans.

Much of the monitoring will be accomplished through normal operating procedures such as contract administration and staff review. Special systems have been developed to measure the biological and physical impacts of plan implementation. For example, control effectiveness will be monitored by post-treatment surveys designed to measure the actual effectiveness of a treatment or combination of treatments. When appropriate, monitoring will include recommendations for additional treatment and/or site rehabilitation.

Implementation and Additional Analysis

This Record of Decision is the next followup program step after completion of a final EIS. The process includes selection of the best alternative, or combination of alternatives, which in this case is Alternative 1. The decision becomes effective upon signature and issuance of this ROD, and BLM will proceed to implement the decision.

The EIS is a regional programmatic statement for controlling noxious weeds on BLM-administered land in Idaho, Montana, Oregon, Washington, and Wyoming and is intended to guide this program for the next 10-15 years. Site-specific environmental analysis and documentation (including application of categorical exclusions where appropriate) will be accomplished at the district level on proposed weed control plans. During site-specific analysis and documentation, public involvement will occur in accordance with the CEQ Regulations for implementing NEPA. Interdisciplinary impact analyses will be based upon this and other EISs, such as resource management plan, timber management plan, and grazing management plan EISs.

If analysis finds potential for significant impacts not already described in an existing EIS, another EIS or a supplement to an existing EIS may be required.

Table 1. Monitoring Plan

Monitoring Element	Method	Frequency	Characteristics Evaluated
Pretreatment Survey	Onsite visual inspection	Each treatment area	Species present, density endangered species present, control options, method chosen
Post Treatment Survey	Onsite inspection	Each treatment area	Effectiveness, need for retreatment, corrective measures or mitigation
Pesticide Use Proposal	Review of proposal and EPA registration by authorized certified applicator.	Prior to any herbicide application	Proposal compared to EPA registration requirements and ROD compliance
Water Monitoring Samples	Pre and post treatment water samples when program is near potable sources and could get into water.	As needed	Potential water contamination
Coordination Monitoring	Weed management plans submitted to Washington D.C.	Yearly	Coordination of plan
Biological Establishment	Survey of biocontrol agents release and establishment	State/District yearly	Establishment, effective ness, and rate of spread of biological control agents.
Threatened and Endangered Surveys	Survey for T&E species prior to action	Each project	Presence of T&E species
Cultural Resource Surveys	Survey for archeological and historical resources	Each project which involves surface disturbance	Presence of cultural resources

APPENDIX I-C

Key Sections of 1992 Record of Decision on the *Western Oregon Program - Management of Competing Vegetation Environmental Impact Statement*

The Decision

In managing competing and unwanted vegetation, the BLM's Decision is to combine features from the eight original alternatives to implement integrated vegetative management, emphasize a preventive strategy, reduce reliance on herbicides, and maintain the flexibility to potentially use all available treatment options in western Oregon. The Decision provides western Oregon-wide program guidance for the vegetation management program in a manner that is flexible for addressing site-specific variables occurring in the resource areas in the Cascade, Coastal and Klamath Provinces in western Oregon.

The BLM has given considerable analysis to the formulation and selection of the Decision features, weighed the risks associated with its implementation against the risks and severity of possible adverse impacts, evaluated public comments, consulted with professionals including accredited toxicologists, analyzed the process involving the USFS mediation document and their implementation guide, solicited public input on the FEIS, and released a draft ROD for public review and comment.

As the FEIS provided, the Decision combines features from the original alternatives in the FEIS, identifies a vegetative management process, specifies project design features and mitigating measures. The Decision emphasizes planning and monitoring, employing a preventive strategy, and reducing reliance on herbicide use.

Important distinctions specific to this approach are as follows:

- A judicious approach to vegetative management through systematic (sequential) program and site-specific planning and analysis where vegetation manipulation is expected to be needed.
- Development of action thresholds for plant communities with the intent of defining conditions that trigger potential needs for corrective treatments, anticipating competition problems, and assisting in monitoring activities. Involves verifying appropriate thresholds for local conditions and effectiveness of the prescription and techniques.
- A specified limit on yearly potential herbicide acreage available to reduce reliance on herbicides.
- Pursuit of adequate funding to make alternative treatments feasible.
- Recognition that herbicides, their formulations, and application techniques vary widely in their potential health effects, and that these decisions should be made on a site-specific basis with the risks of each method and their potential exposures being an important part of the Job Hazard Analysis and risk assessment.

A cap is placed on herbicide treatment in western Oregon in any one year; it will not exceed 8,800 acres. This Decision will retain the current emphasis for the BLM to continue its search for nonchemical methods of vegetative management when control is needed.

Another important part of the Decision is the acceptance of the qualitative risk assessment of BLM Appendix L done by the University of Washington (USFS 1988 FEIS, Appendix H), which was reserved in the FEIS until development of the Final ROD. Acceptance of the qualitative risk assessment signifies its incorporation into the FEIS and this ROD. This qualitative risk assessment addresses the quality of the data underlying the quantitative risk assessment.

The potential impacts of the Decision are within the scope of impacts discussed in the FEIS for the eight alternatives and the significant aspects of their environmental consequences.

Scope of the Decision

This FEIS and ROD apply to all BLM-administered land in the Coos Bay, Eugene, Medford, Roseburg, and Salem districts, and the portion of the Lakeview District previously within the Medford District prior to 1987. Further, the decision applies only to the portion of each activity that pertains to management of competitive and unwanted vegetation. Excepted from the decision is noxious weed control which is analyzed in a separate document, the Northwest Area Noxious Weed Control Program EIS (1986).

The Decision approach is to emphasize the use of prevention and natural processes to manage competing and unwanted vegetation. The decision applies to vegetation management planning and control activities, and sets guidelines and standard operating procedures for implementing such programs.

Treatment options available for consideration in the integrated management program include biological, manual, prescribed fire, mechanical, and chemical methods and techniques. In forest land management programs, these treatments are often essential for the establishment and maintenance of desired plants and for achieving good growth rates of desired vegetation to meet management goals. While controlling competition is key to both of these objectives, the manner in which adequate control of competitive vegetation is achieved varies. It is the variability, need, and manner of manipulation to ameliorate harmful competitive or unwanted vegetation that must be identified, analyzed and communicated on a site-by-site basis.

Planning and implementation of activities on a site-specific project basis will be done according to the NEPA process, and correlated with guidance set forth in this FEIS/ROD and approved land use plans. Site-specific projects may be planned and analyzed on either an individual or group basis.

General Provisions

The focus is two-fold: ***(1) To prevent or minimize the need for future vegetation management or corrective action and also subsequently the need for later treatments, and (2) To emphasize the use of preventive and natural processes.***

The Decision is designed to protect human health and promote long-term productivity of the forest ecosystem while meeting the goals and objectives of management plans for such activities as timber production, habitat management, and maintenance of both transportation systems and recreation sites.

It combines a number of features from the eight original alternatives when corrective action is needed, minimizes impacts on air quality from prescribed fire, and reduces the potential for adverse human health effects.

To facilitate ongoing public involvement, the Decision provides for an interactive review of the vegetation management process throughout planning until project implementation. A public consultation process is also defined.

Guidelines for Implementing the Decision are as follows:

- *Ecological relationships will be emphasized in designing program activities to meet land management objectives (such as timber harvest, roadside maintenance, wildlife habitat restoration).*
- *Human health risks to the public and workers will be evaluated to determine major design features.*
- *Where prevention is no longer a viable option, effective early treatment and alternatives to herbicides of special consideration are to be given priority.*

Vegetation Management Process

Definite steps recognized in the vegetative management process are as follows:

Step 1
Site analysis determines site conditions and potential needs for treatments according to objectives for the site.

Step 2
Strategies are evaluated to select the best planned course of action to implement a preventive approach, in the long term at a minimum.

Step 3
Project design for proposed treatment is developed which includes mitigating measures, public involvement, risk management, monitoring, and predicting of vegetation response.

Step 4
Vegetative management action implemented.

Step 5
Monitoring initiated to determine if course of action taken was effective and if further action is needed to promote the preventive approach.

Important Concepts to the Process

Concepts integral to the vegetation management process for the preventive approach include Integrated Pest Management, Prevention, Thresholds, and Scheduling of Detection and Action as described in the following sections.

Integrated Pest Management (IPM)

"IPM is a systems approach to reduce pest damage (competitive and unwanted vegetation) to tolerable levels through a variety of techniques, including natural predators and parasites, genetically resistant hosts, environmental modifications and when necessary and appropriate, chemical pesticides." (BLM M-9220) For clarity, the decision expands the IPM definition in the FEIS glossary to reflect the generic definition. Further, for consistency, this definition will be used in all BLM western Oregon vegetation management planning and implementation.

IPM generally relies upon a combination of strategies, treatment options and techniques as preventive and corrective defense mechanisms against competitive and unwanted vegetation. When initiated early IPM can avoid vegetative management problems and, when needed, employ a variety of methods and techniques.

The BLM recognizes that the success of IPM is dependent upon several factors: knowledge of vegetative management strategies; a broad range of specific technical skills; planning, monitoring and implementing of multiple interactive steps over a fairly long time frame; potentially-high initial capital investments (e.g., mowers in roadside vegetative control); and consistent funding. Without the development of a vegetative community strategy, and without the planning that considers both single and sequential steps and treatment options, it is common for timing to be short between problem identification and action, and for there to be a lack of the available skills, workmonths, and funding to achieve the objectives. In the latter instances, and when unexpected situations occur, corrective or rescue actions are necessary to meet management objectives; IPM is then limited to selecting control alternatives or no action.

In view of the importance of an effective IPM program to the prevention strategy, the BLM will strive to have appropriate resources available. The BLM will encourage research on specific forest ecosystems and continue analysis on a site-by-site basis, linking these necessary steps to implement effective IPM programs and enable vegetative manipulation that avoids or reduces competitive and unwanted vegetation to acceptable levels. The BLM will also continue to support research towards gaining a thorough knowledge of the requirements of competitive and unwanted vegetation, and of the needs and vegetative growth characteristics of desired vegetation. Any actions that are similar or cumulative should ideally be anticipated during project planning stages and used to determine both the need and timing for control efforts under an IPM program.

Prevention Strategy

A key to implementing the Decision is the major emphasis on prevention as the priority strategy being accomplished through planning, to identify and take advantage of any situations where competitive or unwanted vegetation may not interfere with objectives, or to reduce the need for corrective actions.

In the context of the Decision, the term "prevention" will mean "to detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation in the forests. Prevention is in contrast to treatment, which refers to activities for controlling or eradicating infestations of competing or unwanted vegetation. It also should not be confused with early treatment, which refers to activities for controlling or eradicating existing, small infestations of competing or unwanted vegetation before they interfere with the agency's objectives for managing that area or adjacent lands." (USFS, Med. Doc., 1989.)

Emphasis is on prevention and then early action if action is needed. Other strategies include no action, correction, maintenance, and rescue and restoration. The potential for prevention or another strategy to achieve the goals for a given site will be analyzed prior to commencing any sequence of treatments. The concept of prevention as a planned course of action in forest management has continued to develop and gain emphasis during the past decade as an accepted vegetative management strategy. It was a scoping issue in 1982 at which time it was proposed that such practices be considered under all alternatives and used whenever feasible.

Thresholds Concept

Determining damage and action thresholds is an important part of determining the need for action during the vegetation management analysis process. Thresholds are a measure of the degree or level of competition which depletes environmental resources to the disadvantage of a desired plant.

The appropriate timing of vegetation manipulation should involve determining both damage and action thresholds for control of competitive and unwanted vegetation. Damage thresholds refer to the levels of vegetation abundance where there is a marked decrease in rate of the desired plants' survival and growth.

There appear to be two separate thresholds: one for tree survival and establishment, and another for growth maintenance and release. A survival damage threshold may have a competitive vegetation density level many times greater than the levels desired for optimal growth (free-to-grow), at least for short periods. Also, adequate growth often infers far less than that for "free-to-grow" status.

Because plant communities are a complex aggregation of plants and animals, the thresholds need to be identified and tested for efficacy and dose response at the plant community, or on a more localized level, and over various time periods including periods of drought and adequate moisture. Variance of floristics, dominance, growth habits, and succession from site-to-site may indicate a need for intensive vegetative control in some locations and during some time periods, yet very little control in other years and locations. Meeting the management objectives and maintaining forest health for one or more similar sites is the key to determining thresholds and selecting a vegetative management approach.

Determination of competitive thresholds give managers a better analytical approach in making choices about treatment need, treatment method, technique efficacy, and seedling performance on similar or comparable sites. It will also help determine the appropriate degree of tool intensity necessary to attain an expected level of plantation performance (Wagner et al 1989; Radosevich, et al 1990 New Zealand). To emphasize effective preventive strategies, the BLM will continue developing, modeling, testing, and evaluating appropriate thresholds for action on a plant or ecological community basis.

Scheduling of Detection and Action

Because planning is essential to the prevention strategy, it is necessary to document site evaluations, develop a time-line for the occurrence of expected problems if action is prescribed, and use a pretreatment survey to verify if action is expected to be implemented. Strategies such as planning to avoid certain competitive conditions, developing alternative silvicultural schemes, and taking early action will generally minimize damage and often preclude further treatment.

The time to detect and ameliorate unwanted or competitive vegetation conditions is early in the project planning stages, before growth loss of desired vegetation becomes serious, and before major corrective action is required. This determination of need can occur during regularly scheduled surveys, project analysis, and young stand monitoring.

Priorities

Based upon the foregoing, BLM establishes the following vegetation management priorities in selecting and designing treatment methods to achieve site-specific management objectives:

Priority 1 - Plan at the earliest opportunity to detect and ameliorate conditions that cause or favor the presence of competitive and unwanted vegetation. Also, review data from past treatments of comparable sites to determine potential need and treatment effectiveness.

Priority 2 - Search for, and use, effective nonchemical methods of vegetation control and selective treatments when feasible. Manipulate the potential vegetation and timing of any prescribed actions to attain the desired conditions and minimize the overall need for control of competitive vegetation.

Priority 3 - Use herbicides only after fully considering the effectiveness of all reasonable treatment options, combinations with various methods of manipulation, and herbicide environmental effects, safety, human health risks (exposure), specificity, effectiveness, and their relative costs of implementation. This includes reducing both use levels and exposures to herbicide by employing application techniques and efficient formulations to improve effectiveness and selectivity, minimizing size of treatment areas, and where feasible combining the herbicide option within a mix of other treatments and methods for a program of integrated pest management.

Because not all potential problems develop and many that develop do not reach a threshold level, it may be appropriate for managers to defer action on some units or portions of units to see if problems do develop or if the potential is serious. Generally, however, whenever treatment is needed it is best to take the earliest available action identified to maintain adequate conditions and growth for desired plants. The earliest action often is to manipulate or reduce the problem vegetation while that vegetation is small and easy to treat.

It may not always be necessary to collect new data to respond to issues and evaluate alternatives strategies. Applicable information may be found in existing site records, or from other comparable sites.

Herbicides Available for Use

When herbicides are considered, BLM could use formulations that contain one or more of the following herbicides: asulam, atrazine, 2,4-D, dicamba, glyphosate, hexazinone, picloram, and triclopyr. These herbicides were analyzed for use in the FEIS, and in Appendices D and H which are incorporated into the BLM's FEIS. Use of these chemicals is subject to special mitigation measures summarized in this ROD, and the guidance provided in the Herbicide Profiles.

The selection of herbicides to use, along with the guidance provided in this ROD, recognized that some data gaps exist (see Chapter 6). However, in general, the data gaps occurred where initial experiments did not meet current standards. Also, see Appendix D which was prepared to address data gaps.

Herbicide Formulations and Inert Ingredients

The BLM encourages the use of the least toxic inert ingredients available and requires the disclosure of data necessary to determine conditions of safety before a product can be used.

The reason for this precaution is that most chronic tests of herbicides do not use the full formula, but test only the active ingredient. A high proportion of these formulations have "inert" ingredients which often are neither chemically nor biologically inert and may have substantial toxicity themselves (see Appendix H). Accordingly, only those formulations that do not contain inert ingredients on EPA's List 1 and 2 will be used, unless the risk associated with the listed inert ingredients is evaluated and the formulation found acceptable. In addition to considering EPA information to judge and select the least hazardous inert formulations available for use, BLM will use publicly available manufacturers' data and request acknowledgement about List 1 and 2 inert ingredients.

Two inert ingredients of concern—kerosene and diesel oil (both petroleum distillates)—have been reviewed by the BLM. It was determined that kerosene and diesel oil would not add significantly to the potency of the formulations. Their use will, however, be subject to the following guidelines:

- Kerosene will not be used in herbicide applications except as an inert ingredient in the formulations of 2,4-D (Esteron) and triclopyr (Garlon 4).

- Diesel oil will not be used in herbicide applications as a carrier; however, diesel oil may be used as an adjuvant (not to exceed five percent of spray mixture) (USFS, Region 6 FEIS).

Herbicide Use Restrictions and Precautions

An annual cap of 8,800 acres is placed on herbicide use during the effective life of this FEIS to reduce reliance on herbicides. Herbicides will be used only when other methods are ineffective, or will increase project cost unreasonably. This decision does not infer that herbicides are ineffective or costly. Rather, this decision to limit herbicide use arises from a concern among many people, including professionals, about the use of herbicides.

Further, when selecting a herbicide, the BLM will use only those herbicides for which herbicide profiles are, or will be, available.

Although markedly less toxic than insecticides, herbicides must be handled and applied with care. This need for caution is the reason that EPA registers herbicides, the BLM conducts risk analyses for program and public risk and worker job hazard analysis on site-specific projects. Another precautionary measure in the use of herbicides is that the personnel involved in planning, applying, supervising, and reviewing herbicide applications must be certified.

Precautionary measures BLM will employ relative to all herbicide use include conducting periodic literature reviews by accredited toxicologists, providing information sheets for each of the herbicides approved for consideration, strictly adhering to label regulations, and thoroughly training its applicators in safety precautions as well as proper application technology.

Specific protective measures for herbicide use are provided in Chapter 5 and Appendix B. It should be recognized that further review may show that expanded use of herbicides is justified, or that further prudence is appropriate.

Herbicides of Special Consideration

Due to their known or uncertain adverse human health effects the herbicides 2,4-D, asulam, and atrazine will be placed in a Special Consideration Category requiring special precautions, consideration and analysis whenever they are proposed for use. This will include ensuring that all feasible effective alternatives are considered and protection measures such as aerial restrictions, worker protection and posting and controlling access have been implemented. (See the section on Effectiveness of Practice in Meeting Objectives for a related discussion on selection of herbicides of special consideration.)

Asulam, atrazine and 2,4-D have either incomplete or highly conflicting information about their human health effects. All three have cancer potency values noted in the FEIS, as if they are associated with or are carcinogenic, and recent toxicological data continue to recommend a cautious and conservative approach. Atrazine has controversial and potentially high risk reproductive MOS values, especially for workers and is a confirmed ground water contaminate.

Due to the above, the application technique and placement of atrazine and 2,4-D will require additional controls. A risk management strategy for the public and a job hazard analysis for workers will be developed to assure high risk exposures do not occur.

Program Implementation

Program Design

Implementation of the vegetative management program has two parts: standard operating procedures and project design features. The *standards* are a list of important measures that are applied on a regular basis for the various types of vegetation treatment. *Project design features* are intended to ensure the proper and safe implementation of treatment methods, and are selected based upon site-specific analysis. Analysis of specific treatment areas may result in modification of the project design features, or the identification of others, to provide adequate protection to nontarget organisms and human health. Standard operating procedures are listed below, followed by a list of common project design features.

Standard Operating Procedures

Strategy

Use prevention and natural processes as the preferred strategy to manage competing and unwanted vegetation. Conduct planning and monitoring to anticipate, and take steps to avoid, potential vegetation management problems. When needed, plan corrective actions to occur early and timely as compatible with a long-term preventive strategy and natural disturbance and recovery pattern in the site-specific area.

Safety

Always consider the safety of both the general public and workers. This includes determining the degree of exposure, hazard and risk posed by various vegetation management treatment methods for forestry workers, forest users, and nearby residents.

Program-wide risk assessment will be conducted by the program leaders prior to any treatment where there is potential for direct or indirect effects on human health to evaluate human health exposure to any hazardous substances and injuries. Keep in mind that this preliminary analysis is about generalities, not site-specific instances. Low-risk or low exposure methods will be sought for implementation to minimize public exposure to injurious situations.

In general, the risk assessment process will involve three evaluation components: Hazard, Exposure, and Risk. These components and their interrelationship are described below:

Hazard Evaluation: Identify harmful characteristics of the proposed vegetation management methods.

Exposure Evaluation: Estimate the kinds and levels of exposure and doses likely to result from potential exposures under routine, worst case, and accidental scenarios.

Risk Evaluation: Combine hazard information with dose level exposures to predict the health effects under the given conditions of exposure.

These evaluations are conducted for two groups of people: the general public and the occupationally exposed. A Job Hazard Analysis (JHA) is used to anticipate site-specific human health effects. For the general public, evaluation is done for single exposures and exposures over a 30-year time period.

When considering potentially harmful situations in site-specific evaluations, estimate exposure by identifying: (1) who is being exposed, (2) when the exposure will occur, (3) where exposure would occur, and (4) the amount, duration, and frequency of exposure. These estimates should then be compared to the average conditions found in the FEIS risk assessment and used to determine design and adequacy of mitigating measures.

The "amount" of exposure is the actual quantity or level of a substance that comes in contact with an individual. "Duration" is length of contact, and "frequency" is the number of encounters with the substance. Other factors to consider in exposure analysis include proximity (distance) to human habitation, water source, or potential food stuffs, and recreation use patterns, weather conditions, and access to site.

All employees active in vegetation management will be trained in the safe use of prescribed fire, cutting tools and equipment operation, herbicides, and other techniques. Proper protective clothing will be worn by employees as prescribed in use manuals for methods such as chemicals and fire (BLM Manual H-1112-1).

The project design of prescribed fire will include consideration of such measures as smoke management, reduction, avoidance, and scheduling to protect recreationists and rural residents from smoke exposure (see Appendix B).

Information packets containing data on the potential hazards of chemical treatment methods will be made available to employees, the public, and contractors (see Appendix B and Herbicide Profiles, Appendix C). As new data becomes available, the information packets will be supplemented.

Worker Protection, Public and Occupational Accident/Incident and Illness Reporting

All workers who use or are exposed to hazardous tools/equipment including herbicide applications will utilize protective clothing and equipment that meet the specifications of the BLM Safety Manual, labels approved by the Environmental Protection Agency (EPA), and/or BLM risk analysis. (See worker protection in BLM Manual 9022; Manual Handbooks 1112-1, Chapters 14-16; and H-9011-1.)

A Job Hazard Analysis will be used for monitoring the impacts on human health. In addition an incidents-accidents system will be used for reporting employee, contractor, volunteer and public. In addition to injuries and illnesses, the system will be used to report vehicle accidents, property damage and fire losses (485 DM, Chapter 7 and BLM H-1112-1). Forms CA-1 and/or CA-2 for occupational exposure or injury and DI-134 for all reported accidents, incidents, and illnesses will be used.

The Report of Accident/ Incident (DI-134) will be used additionally to report health effects associated with vegetation management projects for forwarding to the Program Coordinator to be entered the Safety Management Information System (SMIS), reported to OSHA and used internally for trend analyses. The Federal Record System retains records for any employees exposed to toxic substances or harmful physical agents for 30 years (29 CFR Ch XVII 1910.20). Contractors will be required by stipulation to complete a DI-134 for each employee. The DI-134 along with the Project Accomplishment Report (herbicide use report) will list date of project work, specific assignments, herbicide formulation (if any) and ingredients used, safety or health hazards, and any health complaints.

Public Involvement

Determine the need or level of public involvement by reviewing the type of management actions. BLM management actions are divided into five categories (Manual 1790-1):

- Exempt from NEPA. Includes Congressional, emergency and rejected proposals.
- Categorical exclusions. Specifically identified actions, not restricted by exceptions list, that do not require an environmental assessment (EA).
- Actions already covered by an existing FONSI and EA, or EIS. Timber sales and multi-year EA. (Noxious weed control is in a separate EIS.)
- Actions covered by an EIS and require an EA.
- Actions that require an environmental impact statement.

Public involvement is to be encouraged and facilitated in vegetation management environmental analyses. The level and degree of public involvement will depend on public interest, type of analysis performed, and the method of treatment proposed.

The BLM will provide public notice whenever a site-specific project is considered to prevent or treat competing or unwanted vegetation with any proposed measure of treatment. (Excepted are actions exempt from NEPA or covered within a categorical exclusion.)

Public notice will precede the screening stage of the environmental analysis of the project under NEPA guidelines. Notification methods will include, at a minimum, a notice in local newspapers. Additional standard methods may include posting of public notices in the state office, district office and resource areas; and in other public rooms used to distribute public information concerning proposed Bureau actions. Notification lists maintained by the program coordinators will be used in notifying the interested public of any proposed use of herbicides.

In case of an action with effects primarily of local concern, the notice may include: areawide clearinghouses, notices to potentially interested community organizations, direct mailing to owners and occupants of affected property, and posting of notice on and off site in the area where the action is located. The level of controversy will determine the need for notices and posting. Herbicide use areas will be posted. Notices must indicate procedures for interested persons to get information or status reports.

The public will be notified of the availability of the EA and FONSI (Finding of No Significant Impacts additional to those not already analyzed in a program's EIS). The manager responsible for authorizing the action determines the appropriate means of public notification and ensures its availability based on the extent of concern and interest in the action. All individuals or organizations that have requested notification on a specific action should be notified by mail where feasible. When considering the use of herbicides of special consideration the potential use will be made known to the public at the earliest practical time.

Before a decision is made to proceed with controversial treatment methods such as herbicides, the public will be invited to review and comment on the site-specific analysis of the project. When a decision is made for a site-specific project the public will be promptly notified of the final decision whether it is to proceed, or not to proceed.

Environmental analysis and public involvement will normally occur as indicated in four levels of project screening:

1. Screen unit for need of action, and set priorities.
   Where: Reforestation of timber sales or wildfire areas. Actions where no herbicides are proposed for use and the proposed treatment qualifies for categorical exclusions. Examples of current categorical exclusions:
   - Precommercial thinning
   - Manual maintenance and release.
   - Paper mulching and spot scalping.

2. Screen for need and complete environmental analysis. (Outside exclusions or controversial.)
   - Mechanical site preparation

3. Screen for need, complete environmental analysis, inform downstream water users.
   - Biological and grazing methods.

4. Screen for need, complete environmental analysis, inform downstream water users, notify adjacent property owners, provide public notification when there is a probable public exposure, and request response from those individuals who are hypersensitive. This screening should be done when proposing projects for herbicides and prescribed fire to determine appropriate risk management measures.

Considerations for public involvement when proposing vegetative management, regardless of type of treatment, is summarized on Table 5-2.

PROJECT DESIGN FEATURES

Review site-specific conditions to determine which of the following project design features are needed.

Notify Private Landowners and Downstream Water Users

Residents and adjacent landowners within 0.5-mile of proposed treatment sites who likely could be directly affected by chemical drift, smoke, food or water contamination, or an accidental spill will be notified prior to any chemical, broadcast burning, or biological application, and actions will be taken to minimize any potential effects.

Minimum Width Buffer Strips

District guidelines as well as State water quality standards will be met by using buffer strips, contractual stipulations on method and techniques, and other site-specific criteria. Concerns to consider in planning and selecting a vegetative management strategy, treatment, or technique and in determining site-specific project design include stream bank stabilization, sediment rates, temperature, sensitive vegetation and other organisms, and bacteria counts. Buffer strips will meet resource management plan criteria and site-specific conditions.

When herbicides are used, the minimum buffer strips listed below will be reserved adjacent to class I and Important Class II (BLM order III and above) streams, lakes and ponds, pasture and agricultural lands. These minimum buffers will be in accordance with current interim protection requirements of the Oregon State Forest Practice Act requirements and definitions, or as specified on the herbicide use label.

Minimum Buffer Widths for Waterways When Herbicides are Proposed for Use

Application Technique	Minimum buffer Width
Manual wipe-on	High water mark
Manual	10 feet
Vehicle	50 feet
Aerial	100 feet (Flowing stream)
Aerial	200 feet (Lakes and ponds)

Applications of atrazine, a persistent chemical, in areas having shallow water tables or where aquifers are located in alluvial deposits along major streams, will be subject to guidelines for above-ground waterway buffers.

For mechanical and burning treatments, the minimum buffer along streams will be 25 feet.

Residences, Domestic Water Diversions and Agricultural Areas

Minimum buffer strips near residential, domestic water, and agricultural areas is determined by the site-specific application technique.

For aerial application of herbicides in areas adjacent to residences, a minimum buffer strip measuring at least 600 feet wide will not be treated unless a written waiver is provided by the landowner. For domestic water diversions in a drainage where aerial herbicide application is used, the minimum buffer will be 200 feet. Additional risk (exposure) assessment may be required for aerial herbicide treatment within 600 feet of a residence.

Aerial application of herbicides of special consideration (e.g., 2,4-D, asulam and atrazine) will be prohibited within 0.25-mile (1,380 feet) of residences.

For ground applications of herbicides, the minimum untreated buffer reserved between treatment areas and residences will be 100 feet.

Local conditions may require an expansion of the minimum widths. Some examples of site-specific factors that may necessitate additional buffer width include mode of transport (direct application, drift, and water flow), adjacent topography, buffer vegetation structure and functions, and nearby agricultural areas or gardens.

Other Sensitive Conditions

Buffer strips may also be recommended for wildlife habitat, scenic corridors, and other concerns as identified in land use plans.

Monitoring and Evaluation

Monitoring of the western Oregon vegetation management program will be done in accordance with established BLM procedures as provided for in BLM Manual H-1734-1, land use plans, and as indicated below. The need and type of monitoring will be dictated by the nature of critical components in the site-specific treatment area.

General guidelines for monitoring are as follows:

> Monitoring is to be done annually at both the program-wide and site-specific basis, and for worker and human health concerns. The Program Coordinators will: (1) project three-year estimates of proposed methods and techniques, (2) describe whether management actions are making satisfactory progress toward meeting objectives to reduce reliance on herbicides and meet prescribed fire air quality goals, and (3) present criteria for meeting goals.
>
> Site-specific post-treatment monitoring will be conducted to aid future planning, and at a minimum will include:
>
> - Efficacy of treatment or no treatment.
> - Costs, both direct and indirect.
> - Analysis of mitigating measures, unintended effects, and accidents.
> - Estimate of degree of success.
> - Assessment of both short and long-term effects on vegetation.
>
> Water Quality monitoring will be conducted per goals in land use plans to meet or exceed Best Management Practices guidelines. Monitoring of the spray operation will be conducted to determine if mitigating measures are being observed, are effective in maintaining water quality, and are in compliance with state water quality standards and herbicide label requirements. The potential for contamination of aquifers used by fish, or for municipal water or irrigation, will be considered in site-specific environmental assessments.
>
> The program-wide assessment will consider:
>
> - How well strategy is meeting management objectives (site preparation, seedling survival, improving wildlife habitat, roadside maintenance). Include "no action" locations in comparisons.
> - Whether assumptions are correct and potential impacts are as expected.
> - Effectiveness of mitigating measures.
> - Impacts on other resources (i.e., wildlife, water, air).
> - How projected need for herbicide and prescribed fire treatments can be reduced.
> - Consistency with federal agencies, state and local governments.
> - New data that would require alteration of program.

Recording and reporting human health concerns would be done to verify job hazard analysis and risk assessments and would include review of:

- Exposure incidence.
- Accidents.
- Worker health complaints.
- Recording of treatment methods, including for herbicides: the exact identity, formulation, manufacture, mixture and method of application.
- BLM Herbicide (Pesticide) Application Record, and worker and public Reports of Accidents/Incidents or Illnesses (DI-134, CA1 or CA2) for vegetative management projects.
- Names of personnel working on herbicide projects, their assignments and dates of actual work (29 CFR XVII, 1910.20)

The Program Coordinator will incorporate any new data that would require alteration of the program.

Conduct young stand monitoring during standard stocking survey at intervals of one, three, and five years and record treatment effectiveness, or as a post treatment evaluation survey on a sampling basis to be filed with BLM Project Implementation (Herbicide Application) Records.

Submit annual report to Oregon State and Washington Offices for herbicide usage describing the acreage, amount, usage, location, and use strength for each chemical used. Retain project records for three years.

The above monitoring, along with planning and providing “no action” units or portions of units will help to determine effectiveness and need for action as a baseline comparison. Through these actions, the BLM will be able to determine if the actions are giving the desired management results.

Appendix I-D

Public Involvement in the Process So Far

Public involvement has been an integral part of BLM's resource management planning (RMP) process from its onset. To date, public involvement activities have included several information mailers or brochures; public, group, and open-house meetings; field trips; distribution and review of planning documents; comment periods; informal contacts; written letters; and responses to comments. A May 1986 mailer initiated the effort by asking for input on the types of public involvement activities in the RMP preparation process.

A September 1986 mailer outlined the overall planning schedule and requested comments on the first major planning step, Issue Identification. This planning step was also announced in *The World*, a daily newspaper published in Coos Bay, and several local weekly newspapers. The public was invited to identify any issues or concerns they believed should be addressed in the RMP process.

During this planning step, each western Oregon district hosted an open house to acquaint local citizens with the planning process and schedule, and to discuss issues related to the planning process. Total attendance was 24 people for the two open house meetings held in Coos Bay in October 1986.

Based on public comments received statewide during the Issue Identification step, BLM prepared another district mailer in March 1987 that summarized publicly-identified issues and concerns. The Summary of Scoping later in this section describes the comments on issues and concerns in greater detail. Also addressed in this mailer were the second and third planning steps: Development of Planning Criteria (including State Director guidance) and Collection of Inventory Data. The mailer included a schedule of each western Oregon district's public meetings and field trips planned to provide review and discussion on the technical elements of inventory collection, particularly forest inventory techniques. The mailer identified a proposed timber harvest computer model and asked for public comment specific to the model. Eleven people attended the two open house type meetings, held in May 1987 in Coos Bay, where BLM described the method used in conducting the Timber Production Capability Classification and Operation Inventory for the planning process.

In August 1987, BLM distributed another mailer specific to the Planning Criteria and the proposed State Director Guidance, and requested comments on relevant topics for the latter. The mailer included a schedule for public demonstration of the proposed timber harvest computer model. Demonstrations were conducted in Roseburg and Portland in September of 1987, with 14 people attending the Roseburg demonstration of the proposed TRIM-PLUS Allowable Harvest Model. The Roseburg session also included a comparison of other harvest models to the TRIM-PLUS model.

In January 1988, a mailer was distributed to announce the projected availability, and to determine who was interested in receiving a copy, of the draft State Director Guidance document. The draft was released in May 1988 and mailed to those who requested copies. Additional copies were available through all district offices, as well as open house meetings held in each district and the state office. The Coos Bay district open house, held June 11, 1988 to discuss the State Director Guidance document, was attended by 31 people. A comment period followed the open house meetings, and approximately 70 written responses were sent to the state director by the end of August 1988. The responses included a document submitted by the Coos Bay District Advisory Council. Proposed revisions to the State Director Guidance and responses to public comments were shared with the original respondents for further review and comment in several letters during 1989 and 1990.

The Summary of the Analysis of the Management Situation (AMS) was published and distributed to approximately 350 people who requested copies. Additional copies were available for distribution at the Coos Bay district office. On February 11, 1991, two open house type meetings were held to answer questions on the content of the AMS. A total of 38 letters were received from individuals, organizations, or governmental agencies who provided suggestions for improving the AMS, or offered opinions or preferences for structuring the Preferred Alternative. Information from these letters were utilized by the district to update the AMS and assist in the preparation of this RMP/EIS.

In July 1991, a mailer was distributed to inform the public about revised State Director Guidance for Formulation of Alternatives and Analytical Techniques Needed to Estimate Effects of Alternatives.

In addition to the above formal notifications, the Coos Bay District prepared ten separate newsletters, sending copies to approximately 700 people on its mailing list to report the status of the planning process. District Advisory Council members have also been briefed at each of their meetings since 1986.

Throughout the planning process, members of the district staff and management team have been involved in an ongoing effort seeking public involvement opportunities and making presentations to local groups, service clubs, and associations.

Summary of Scoping

Scoping of the Coos Bay District Resource Management Plan/Environmental Impact Statement (RMP/EIS) began in September 1986. At that time over 700 people were invited, by mailer, to identify issues and concerns for BLM to consider in the planning process. The district held two open houses during the comment period to explain the RMP's focus and general preparation process.

From the comments received, the district's planning team and managers distilled a list of issues and concerns. An issue was distinguished as a matter of controversy or dispute over resource management activities or land use that was either well-defined or topically discrete and could be addressed in the formulation of planning alternatives. In practice, issues are resolved by resource allocations and restrictions. Concerns, on the other hand, are generally not so well defined, or do not directly involve controversy or disputes over resource management activities or land use allocations, and also do not lend themselves to formulating land use alternatives. Concerns are usually addressed by analysis and documentation in the RMP/EIS. Some concerns are not addressed by the RMP/EIS, as they are beyond the control of the State Director, are unrelated administrative problems, or are not within the legal jurisdiction of BLM.

The issues and concerns identified during the initial scoping phase are described in Chapter 1. This list was sent to interested parties in March of 1987.

Further scoping related to refinement of the issues, and determination of a reasonable range of alternatives to address in the RMP/EIS. The latter facet of scoping involved formulation of alternatives and was handled through development of the State Director's guidance, which is discussed in Appendix II-B. State Director guidance also directed that a number of sensitivity analyses of the primary alternatives address relevant management options that could not be effectively addressed in a manageable array of fully analyzed alternatives.

In the public comments and internal discussions, a number of other alternatives or potential elements of alternatives were considered but eliminated from detailed analysis. These are summarized below:

- Alternatives that would meet specified timber production target levels (e.g., one identified in a regional supply analysis or one that would maintain the level in existing plans). Such alternatives could be explicitly designed only with an optimization model. Early in the planning process, BLM chose not to invest the many millions of dollars needed to adopt and use an optimization model in its western Oregon planning effort.

- Alternatives that explicitly reflect the policies and programs of the O&C counties, and of the State. Until opportunities and trade-offs are fully analyzed, such alternatives could not be formulated. At that point in the process, it was BLM's intent to develop a preferred alternative consistent with those policies and programs to the extent of their consistency with each other and also with federal laws and regulations.

- An alternative based on the assumption that FLPMA, rather than the O&C Act, was the predominant statutory mandate for management of the O&C and CBWR lands. None of the initial set of alternatives was based on a specific real or assumed statutory mandate. BLM believes that management under FLPMA falls within the range established by the initial set of alternatives.

- A “no planned timber harvest” alternative. BLM considers such an alternative for all BLM-administered lands in western Oregon outside the reasonable range of alternatives. The counterpart of a no-timber-harvest alternative would be an alternative that would remove all merchantable timber over the life of the plan. Such a radical departure from sustained yield principles on either end is clearly outside the reasonable range of alternatives.

- Alternatives considering neither intensive management practices nor the “allowable cut effect” in setting an allowable sale quantity. The impact of foregoing these can be identified from the sensitivity analysis of the preferred alternative.

- An alternative which would forego slash burning; one that would forego use of herbicides. These activities and the options of foregoing them are addressed in BLM’s EIS, Western Oregon Program-Management of Competing Vegetation, 1989. This RMP/EIS is tiered to that EIS.

- An alternative that uses uneven-aged management as the predominant silvicultural system. In many locations that prescription would fail to meet reforestation standards, which would violate the sustained yield mandate. Uneven-aged management is considered for use in stands where it would be economically and environmentally feasible and reforestation standards could be met.

- An alternative which excludes Site IV lands from timber harvest. Such an alternative would not address any important environmental or resource management objectives better than options already being addressed.

- An alternative that maximizes timber production subject to the constraint of economic feasibility. Analysis of the economic feasibility of Alternative A showed that such a constraint would negligibly affect the ASQ of that alternative.

- Alternatives which vary by size of northern spotted owl habitat protected for each nest site. Considering the Interagency Scientific Committee report and subsequent proposals by the Fish and Wildlife Service, BLM concluded that such variation had little relevance.

- An alternative that would protect 110 spotted owl areas, as provided for in the 1987 revised BLM-ODFW agreement. This alternative, originally proposed by BLM, was dropped from consideration after the Interagency Scientific Committee report was released in 1990 because it was no longer relevant.

- An alternative that manages all lands inventoried as VRM Classes III and IV as VRM Class II. Such an alternative would only be logical if matched with the other goals of an alternative with a very constrained timber harvest base. The intent of this management option was to optimize protection of scenic values, even on areas identified in inventories as low in scenic value. This option was considered too arbitrary to warrant its application as an additional constraint on alternatives that already severely restrict timber production for the emphasis of more meaningful objectives than scenic value.

- An alternative protecting a minimum of 0.25 mile-wide riparian management areas (RMAs) along third order and larger streams, Class I streams and other waters; and maintaining and enhancing water quality at the highest level of water quality required for municipal use. Such an alternative would exclude almost all commercial forest lands from timber management. Because such extensive RMAs would be far in excess of what is needed to protect water quality and riparian values, this alternative was considered outside the range of reasonable alternatives.

Appendix I-E

Concerns Expressed to the Coos Bay District

Listed below are concerns identified by public response to Coos Bay District Scoping Mailer of September, 1986.

- Maintain, increase or decrease the amount of land dedicated to the production of wood products.
- Maintain, increase or decrease the intensive forest practices to be employed (burning, planting, herbicide/ pesticide application, precommercial and commercial thinning, fertilization and genetics).
- The harvest techniques to be utilized (even age/uneven age harvest), size and distribution of units and minimum harvest age or rotation length.
- The potential affects harvesting of forest products will have on water quality, wildlife and fish, economics and other resources.
- Increase the number of small sales and provide more firewood.
- Plant a diversity of species, do not practice monoculture.
- Old-growth should be managed (harvested) for its present economic values.
- Consider the compatibility of forestry, recreation and tourism in the allocation of land uses.
- Representative stands of old-growth should be maintained and be dispersed throughout the entire district.
- More old-growth/all remaining old-growth should be preserved/dedicated for wildlife and other resource values.
- Isolated patches of old-growth located within large burn areas should be managed for wildlife.
- Management for big game species (elk, deer and bear).
- Management for non-game species.
- Management for cavity-nesting species.
- Management for habitat diversity to maintain populations of elk species.
- Maintenance of habitat for all wildlife species on lands not designated for intensive forest management.
- Monitor and continue to study the habitat needs of northern spotted owl (NSO) before dedicating more land for the NSO.
- Habitat management by BLM may affect management on adjacent private lands.
- Harvesting of private lands should be considered by BLM in developing wildlife plans (cumulative effects).
- Maintenance of unique habitats such as cliffs, talus slopes, caves, meadows, wetlands, springs and bogs, beaches and dunes, and calving areas.
- Maintain water quality for domestic use.
- Utilize road construction techniques which will protect water quality.

- Limit soil disturbance in road construction and harvest operations to maintain water quality.
- How will management of adjacent private lands affect BLM management for water quality (cumulative affects)?
- Management for anadromous fish species (salmon, steelhead and trout).
- Protect riparian areas for fisheries.
- Manage riparian areas for water quality and the production of forest products.
- Have best management practices been effective?
- Visual management constraints should apply only on areas designated by the state and federal agencies.
- Can the BLM manage the visual resource with its checkerboard ownership?
- Uneven age management and/or shelterwood management should be allowed in Visual Resource Management (VRM) areas.
- Provide trails or back country experiences.
- Open/close more roads.
- Open/close more areas to Off Road Vehicle (ORV) use.
- Designate areas for quality hunting opportunities.
- Develop more campgrounds complete with toilets and potable water.
- Transfer all Bureau land to other federal agencies.
- No disposal of Bureau lands should occur.
- Acquire all in-holdings.
- Don't dispose (sell/exchange) commercial forest land for non-forest usage.
- It may be advantageous for management not to acquire some lands in exchange.
- Should BLM provide lands that another Federal agency can use to acquire private in-holdings?
- Exchange lands for the benefit of wildlife and/or other resources.
- Harvest practices should be different for O&C and PD lands.
- Maintain or increase timber harvest to provide economic stability, employment opportunity and receipts to the Federal Treasury and county receipts.
- Provide for non-timber resource values to the extent possible consistent with the intensive management of commercial forest land base.
- Examine the dominant use mandate of the O&C Act in allocating land to non-timber resources.
- Maintain or increase county revenue generated from BLM land.

- Provide opportunity for economic development.
- Timber sales should be cost efficient.
- Intensive management practices should be employed.
- Actively seek funding necessary for the full implementation of the preferred alternative.
- There should be flexibility in the yearly allowable cut to allow for market fluctuation.
- Offshore oil/gas exploration/development could impact onshore management.
- More/less land should be available for mineral exploration/development.
- Include Areas of Critical Mineral Potential (ACMP) in the plan.

Concerns Outside the Scope of the RMP/EIS

- BLM should enter Coastal Oregon Productivity Enhancement (COPE).
- BLM should budget for law enforcement.
- BLM should provide funding for marijuana control.
- BLM should budget for road construction/maintenance.
- BLM should develop guidance/better guidance for the management of Natural Research Areas (NRAs).
- BLM should provide for predator control.
- Where can human resource programs (e.g., YACC, Job Corps) be implemented to help in the management of BLM lands?
- BLM should conduct an analysis for private rather than public development of industrial or recreational areas.
- BLM should utilize a measuring system compatible with industries systems.
- Simultaneous production of six RMPs.
- BLM should adjust the allowable cut annually based on funding levels.
- BLM should consider the availability of Forest Service, state and private timber in determining the allowable harvest level.

Appendix II

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Appendix II-A

State Director Guidance for the RMP Process

According to Bureau regulations for preparing RMPs, "the State Director shall provide quality control and supervisory review, including plan approval, for plans and related environmental impact statements and shall provide additional guidance, as necessary, for use by District and Area Managers." "Guidance" means "any type of written communications or instructions that transmits objectives, goals, constraints or any other direction that helps District and Area Managers and staff know how to prepare a specific resource management plan."

Early in the process, due to concurrent preparation of this RMP and five other RMPs which together cover all BLM-administered lands in western Oregon, the BLM State Director decided to develop comprehensive procedural guidance as planning criteria to assure consistent treatment of a variety of issues and concerns in the six plans. This intent was conveyed to interested parties in a mailer distributed on March 27, 1987 by each BLM district office with planning responsibility. The mailer solicited suggestions for content of that procedural guidance.

The limited public response to that mailer, along with internal BLM recommendations, was used to formulate a proposed set of topics for State Director guidance. Those topics were described in a mailer sent to the public for comment on August 11, 1987. From the comments received, BLM slightly modified its list of topics and drafted Proposed State Director Guidance. The draft guidance was distributed on May 13, 1988 for public review by interested parties.

Although less than 100 individuals and groups responded, many of the comments received were constructive and addressed the proposals in depth. BLM substantially revised many sections of the proposed guidance on a staggered schedule to distribute the workload and provide timely guidance to the districts for each step in the process.

The first element completed was Guidance for the Preparation of the Analysis of the Management Situation (AMS). This document is a summary of important information about existing resource conditions, resource uses and demands, management activities and natural relationships. It provided the baseline for subsequent steps in the planning process, including the design of alternatives and analysis of environmental consequences. The AMS also provided most of the data to be summarized in the "affected environment" chapter of the EIS. The AMS guidance prescribed minimum contents and table formats for the AMS for each plan. That guidance was essentially completed in October 1988, and slightly revised during 1989 and 1990.

A master glossary for the AMS was prepared as part of the State Director Guidance. It was completed in 1989 and later revised for inclusion in each Draft RMP.

The Guidance for Formulation of Alternatives was essentially completed in October 1990, but modestly revised during 1991 and 1992. A copy of the final version of this guidance is included in this appendix.

Two other sections, Guidance for Analytical Techniques Needed to Estimate Effects of Alternatives and Guidance for Use of the Completed Plan, were completed in July 1991, with slight modification of the former in 1992. Complex analytical techniques have been included in the appendices to provide further discussions of relevant analyses in Chapters 3 and 4. The Guidance for Use of the Completed Plan was incorporated in the equivalent section of Chapter 2 of the Draft RMP/EIS.

The original draft guidance had two other sections that never became final. Guidance for the Executive Summary was not needed because the State Director's staff prepared that summary. Guidance for expressing consistency with plans, programs and policies of other agencies was never formalized, since, until the Draft RMP/EISs were almost complete, BLM staff coordinated with state agencies and county planners on ways to express such consistency.

Appendix II-B

Guidance for Formulation of Alternatives

Introduction

The purpose of alternatives is to identify a range of reasonable combinations of resource uses and management practices that respond to planning issues and provide management direction for all resources. Five common alternatives will be addressed in each RMP, to provide a consistent set of distinct choices among potential management strategies.

A no change from the existing land use plan alternative will also be addressed. This is the "no action" alternative. In the other alternatives all existing land use decisions not found valid for continued implementation after 1990 (through an analysis summarized in the Analysis of the Management Situation), will be reconsidered.

Common alternatives that identify specific management actions along District boundaries will be consistent. Examples include elk management areas, spotted owl corridors or visual corridors.

This Guidance for Formulation of Alternatives may be modified later based on information identified in the districts' analyses of the management situation, or refinements that flow from the districts' site-specific development of common alternatives.

Goals and Objectives of the Common Alternatives

The purpose of the goal and objective statements for the five common alternatives (A through E) is to guide development of specific criteria. Each alternative, if implemented, is intended to achieve or meet its goal. Goal and objective statements focus on general direction of alternatives rather than technical points in issue-related criteria for the alternatives. In each alternative all resource management values would be accommodated to the extent consistent with the primary goals and objectives for that alternative.

Specific Guidance on Common Alternatives

The common alternatives would differ primarily in the way they allocate primary uses of lands (for example, lands allocated to intensive forest management, and lands allocated to protection of riparian zones).

The discussion on page II-B-2 through page II-B-15 describes criteria for addressing each of the eleven planning issues in the formulation of the common alternatives. It also describes how land use allocations and management actions would vary in response to each issue. Within the specific constraints provided by the guidance for addressing each issue, the districts have flexibility to formulate the common alternatives as they consider appropriate to meet the goals and objectives of each alternative.

	Alternative A	Alternative B
GOALS:	Emphasize high production of timber and other economically important values on all lands to contribute to community stability.	Emphasize timber production to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources on O&C and CBWR lands. Give equal consideration to all resource values on public domain lands.
OBJECTIVES:	• Produce the highest sustained yield of timber on all suitable forest lands legally available for harvest. • Contribute to ecological functions important to timber productivity and to habitat diversity to the extent possible consistent with the allocation for timber production. • Manage threatened and endangered species habitat as legally required. • Provide Research Natural Areas and eligible Areas of Critical Environmental Concern to the extent consistent with the allocation for timber production. • Manage appropriate Congressionally designated areas to maintain and enhance their scenic values. • Meet legal requirements for protection of wetlands and water quality, to protect anadromous fish habitat and other relevant values. • Emphasize substantial developed and dispersed motorized recreation uses. • Find no additional rivers suitable for designation under the Wild and Scenic Rivers Act. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities. • Provide no special management in rural (residential) interface areas.	• Produce a high sustained yield of timber on O&C and CBWR lands, and on public domain lands where nontimber uses and values are of lesser importance than timber production. • Contribute to ecological functions important to timber productivity and to habitat diversity using a system that maintains old growth and mature forest in large and small blocks. • Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern to the extent consistent with high timber production. • Retain existing Research Natural Areas (RNAs) and Areas of Critical Environmental Concern (ACECs). Provide new ones from eligible areas to the extent consistent with the emphasis on timber production. • Manage scenic resources in selected areas of high recreation use. • Meet legal requirements for protection of wetlands and water quality and provide moderate additional protection for anadromous fish habitat, other substantial streams, and other water. • Provide for a wide range of developed and dispersed motorized recreation uses and opportunities, to minimize conflicts among recreation user groups. • Find eligible river segments suitable for designation as recreational, if they are important and manageable, and designation would not cause adverse economic impact. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities on O&C and CBWR lands, and which benefit a variety of uses and values on public domain lands. • Adopt appropriate special forest management practices on BLM-administered lands intermingled with or adjacent to rural interface areas zoned for most dense residential occupancy.

Alternative C	Alternative D	Alternative E
Provide timber production to contribute to community stability consistent with maintenance of biological diversity and the variety of other uses such as fish and wildlife habitat, recreation, and scenic resources on all lands.	Emphasize protection and reestablishment of spotted owl habitat, along with management and enhancement of other values such as dispersed nonmotorized recreation opportunities and scenic resources, while sustaining some timber production.	Emphasize protection of older forests and management and enhancement of values such as dispersed nonmotorized recreation opportunities and scenic resources.
• Produce a moderate sustained yield of timber. • Provide biological diversity using a system that maintains some old growth and mature forest, focusing on protection of areas where special status plant and animal species cluster. • Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern through emphasis on biological diversity and to the extent consistent with moderate timber production. • Retain existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities. • Manage scenic resources in selected high use areas, particularly emphasizing protection in corridors of existing and proposed wild and scenic rivers and major trails. • Provide substantial protection for anadromous fish habitat, other substantial streams and other water environments. • Provide for a wide range of recreation opportunities emphasizing dispersed use, while reducing conflicts among recreational user groups. • Find eligible river segments suitable for designation as scenic or recreational, if they are important and manageable, but not suitable for designation as scenic if designation would cause adverse economic impact. • Make land tenure adjustments to benefit a variety of uses and values. • Adopt appropriate special forest management practices in rural interface areas zoned for moderate or high density residential occupancy.	• Produce a sustained yield of timber consistent with allocations for other uses and values. • Protect habitat of the spotted owl in accordance with the Owl Conservation Strategy. • Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern. • Retain all existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities. • Manage all identified scenic resources. • Provide substantial protection for wetlands and riparian areas along most streams and other water. • Emphasize dispersed nonmotorized recreation opportunities. • Find eligible river segments suitable for designation as wild, scenic or recreational, if they are important and manageable. • Make land tenure adjustments which would emphasize enhancement of nontimber uses and values. • Adopt special timber harvest and forest management practices in rural interface areas zoned for moderate or high density residential occupancy.	• Produce a sustained yield of timber consistent with allocations for other uses and values. • Protect all old growth and older mature forests. • Protect habitat of all threatened and endangered species, species with high potential for listing and species of related concern. • Retain all existing RNAs and ACECs and designate all eligible areas. • Manage all identified scenic resources and provide some visual resource protection for all lands. • Manage all riparian areas and wetlands to maintain and improve water quality and fisheries habitat, and contribute to wildlife habitat diversity. • Emphasize dispersed nonmotorized outdoor recreation opportunities. • Find all eligible river segments suitable for designation as wild, scenic or recreational rivers. • Make land tenure adjustments which would emphasize enhancement of nontimber uses and values. • Adopt special timber harvest and forest management practices extensively buffering rural interface areas zoned for moderate or high density residential occupancy and other rural interface areas as appropriate.

	All Common Alternatives	Alternative A
Issue No. 1: Timber Production Practices: Which forest lands should be available for timber management, and what practices should be used on those lands?	Guidance for All Common Alternatives: Lands allocated to intensive forest management under any of these alternatives would normally provide the highest nondeclining harvest level (even flow) of timber when the following conditions prevail: • Effective silvicultural techniques (such as clear cutting, shelterwood or partial cutting) appropriate to the land allocations are used. • All feasible site preparation and intensive management practices are applied. • Anticipated merchantability is the only constraint on minimum average stand diameter slated for future harvest. (In some areas this may result in harvest of timber stands as young as 40 years for several decades during the early to middle part of the next century under some alternatives.) • Adequate budgets are available to support the resultant timber sale program and allied intensive management practices, as well as scheduled monitoring linked to those activities. The common alternatives assume these practices and conditions on the lands allocated to intensive timber management, but incorporate less intensive management practices on other available forest lands to the extent needed to be consistent with the allocation of those lands. Where consistent with the goals and objectives of each alternative, the following silvicultural and harvest practices would be implemented on lands allocated primarily to timber management, to meet multiple land use objectives: Minimize regeneration delay by reforesting harvested sites as soon as practical. Calculate an empirical regeneration period based on representative stocking survey results, expected timber sale contract lengths and management objectives. Reforest harvested lands with indigenous commercial tree species. Emphasis would be placed on utilization of genetically improved stock in accordance with the Western Oregon Tree Improvement plan. Manage tree seed orchards to produce adequate supplies of genetically improved seed. Use available site preparation and seedling protection practices, including herbicides, using an integrated vegetation management approach. Emphasize those techniques that have proved most effective in assuring seedling survival and growth. (Actual practices will be based on site-specific analysis following completion of the RMP.) Convert to conifers those lands classified as commercial forest lands presently occupied by grass, hardwoods and brush.	Allocate all forest lands for timber production consistent with the management direction for other resources (Issue Nos. 2 and 3, etc.) in this alternative, except the following: Nonsuitable Woodland (See Figure II-B-1 for Chart showing TPCC categories.)

Alternative B	**Alternative C**	**Alternative D**	**Alternative E**
Allocate all forest lands for timber production consistent with the management direction for other resources in this alternative, except the following: Nonsuitable Woodland Suitable Woodland - Low Site	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - Low Site Suitable Woodland - Nonsuitable Commercial Forest Land	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - All Categories	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - All Categories The Fragile Gradient-Restricted component of the Fragile Suitable TPCC category Site Class V

	All Common Alternatives	Alternative A
Issue No. 1 (Continued)	Plan hardwood sites for management of a sustained yield of hardwoods, where consistent with allocations for other uses or values. Implement commercial thinning of present and future stands where practicable and where research indicates increased gains in timber production are likely. Practice initial spacing control of seedlings/saplings through planting or thinning in conjunction with the control of competing vegetation, to maximize wood production by concentrating site resources in individual tree growth. Plan nitrogen fertilization applications for all present and future stands where research indicates increased wood yields would result. Plant specific root disease centers with resistant tree species. Consider uneven-age management in stands where this method would be economically feasible and would maintain environmental values. Consider efficiency of field operations and assurance of prompt reforestation in selecting the size of timber harvest units. Apply proper soil management measures to maintain soil productivity.	
Issue Nos. 2 and 3: Old-Growth Forests and Habitat Diversity To what extent and where should old-growth and/or mature forest habitats be retained, maintained or reestablished to meet various resource objectives? To what extent and where should BLM manage habitat to support populations of native wildlife species?	Any wildlife habitat management practice (such as nest boxes, road closures and forage seeding) not listed in the following could be implemented under any of the alternatives, as long as it is compatible with other management objectives. All special habitat features would be managed to protect their values. Mature and old-growth forests would be retained where Congressional designation of areas requires it. Snags and/or wildlife trees (to be converted to snags) would be retained where they occur on lands not allocated to timber harvest, except where public safety is a concern, and if left standing as nonmerchantable material on available forest lands. Where it would contribute to meeting wildlife tree objectives, create snags in areas not allocated primarily to timber production. A habitat goal of timber sale contracts would be to leave all snags and nonmerchantable trees that can be left consistent with safety considerations.	Mature and old-growth forests would be retained on most lands excluded from planned timber harvest by inclusion in the following allocations and TPCC categories: Nonsuitable Woodland Riparian Management Areas Existing high-use recreation sites T&E species recovery areas where timber harvest is prohibited Wilderness Areas

Alternative B	Alternative C	Alternative D	Alternative E
Contribute to habitat diversity using a system that protects mature and old-growth forest in large and small blocks. Mature and old-growth components of the forest would be distributed in a corridor system by seed zone and elevation. In the corridor system large blocks of approximately 640 acres would be connected by a series of small, stepping stone blocks of approximately 80 acres, spaced at about one-mile intervals. Blocks would be limited to defined corridor areas. Public Domain lands and the following allocations and TPCC categories on O&C and CBWR would receive priority for placement into the system, to the extent that they fit; for instance, if they provide needed habitat and are suitably located to contribute to the system. Nonsuitable Woodland Suitable Woodland - Low Site Riparian Management Areas Recreation Sites T&E species recovery areas where timber harvest is prohibited Special Areas (Natural Areas, ACECs) Wilderness Areas	This alternative would provide for retention and improvement of biological diversity. Blocks of forest land at least 600 acres in size and, where relevant opportunities exist, at least 2500 acres in size (including cornering tracts) would be identified as old-growth restoration and retention areas, totalling 15 to 20 percent of BLM-adminstered forest land. Identification of these areas would focus on protection of older forest stands, connectivity between larger reserves and subregions, and protection of identified areas where special status plant and animal species cluster. The remaining BLM-administered forest lands, not excluded from timber harvest to address other issues, would be subject to intermediate harvests for density management where feasible, to maintain open canopy conditions and promote retention of mixed species, as well as accelerate development of old-growth structure conditions and prepare the stands for regeneration harvest	This alternative would manage habitats on BLM-administered lands to provide for a number and distribution of spotted owls that ensures continued existence of a well distributed population on those lands, so they may interact with spotted owls throughout the geographic range of the species, as recommended by the Conservation Strategy for the Northern Spotted Owl. Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM-administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.	This alternative would preserve the following: - all existing forest stands over 150 years old. - additional lands within 400 feet of the above stands, to assist in maintaining natural ecological elements, protect the older stands from edge effect and natural disaster, and interconnect them into a sustainable network. - all suitable habitat forest stands which most closely match the lands within two miles of each spotted owl site occupied by a single or pair of owls in the last six years (1985-1990). In addition protect younger forest where needed to provide contiguous habitat within a mile of those sites. - in each section where BLM administers at least half of the land, a 40-acre block of the oldest stands remaining, concentrated around headwaters streams, to provide habitat for amphibians and nesting for pileated woodpeckers.

	All Common Alternatives	Alternative A
Issue Nos. 2 and 3 (Continued)		
Issue No. 4: Threatened and Endangered (and Other Special Status) Species Habitat What should BLM do to manage Federally listed threatened or endangered plants and animals and to prevent future Federal listing of plants and animals as threatened or endangered species?	Protect, monitor and manage habitats of Federal listed and proposed species in accordance with the Endangered Species Act and recovery plans, as legally required for self-sustaining survival.	Timber production constraints would be assumed in the formulation of the alternative only if critical habitat has been designated or there is a recovery or conservation plan within a month after completion of the Analysis of the Management Situation. Manage for the conservation of, and mitigate actions to protect habitats of, Federal Candidate, State Listed and Bureau Sensitive species where such actions would not diminish commercial use such as timber production.
Issue No. 5: Special Areas What areas on BLM-administered lands need special management to prevent irreparable damage to important historic, cultural or scenic values; to protect botanical or fish and wildlife resources or other natural systems or processes; and to protect life and safety from natural hazards? Which of these areas should be formally designated as Areas of Critical Environmental Concern (ACEC)?	Any areas considered appropriate for Research Natural Area (RNA) designation would also be considered appropriate for ACEC designation.	Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities (e.g., Wild River designation, the Endangered Species Act). Existing ACECs and potential ACECs that meet the preceding standard, including RNAs and proposed RNAs, would be retained or designated on nonforest lands or nonsuitable woodlands of no substantial mineral potential. Other existing ACECs and RNAs would be revoked.

Alternative B	Alternative C	Alternative D	Alternative E
Suitable wildlife trees and/or snags would be retained to maintain, where possible, cavity-dweller populations at 40 percent of the optimum woodpecker population levels in new timber harvest units. Wildlife tree management practices would be used on the available forest lands, including retention only of green culls and snags.	in the future. Regeneration harvests on these lands would be either heavy partial cuts (green-tree retention) or group selection cuts, and would not occur until after a stand had established old-growth characteristics. The lands in old-growth restoration and retention areas, which have not attained old-growth characteristics, would be subject to similar density management, where feasible, until they attain such a condition. Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.		In addition to retention of wildlife trees on lands not allocated to timber management, suitable wildlife trees would be retained to contribute to the maintenance of cavity-nester populations at 60 percent of the maximum potential population level on lands allocated to timber management. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitats would be appropriately buffered.
Same as Alternative A, except protect habitats of Federal Candidate, State Listed and Bureau Sensitive Species to the full extent on public domain land, and protect habitats of Federal Candidate (i.e., Category 1 and 2) species known only to occur on BLM-administered lands to the extent considered necessary to prevent their federal listing.	Same as Alternative B except for additional protection of special status species provided by criteria for Issues 2 and 3.	Manage all BLM-administered lands to support the conservation and protection of all Federal Candidate, State Listed, and Bureau Sensitive species and their habitats.	Same as Alternative D.
Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Do not allocate new RNAs on available O&C or CBWR land if a similar feature can be protected on a National Forest. Designate all potential ACECs (including RNAs) on Public Domain lands, nonforest lands, nonsuitable woodlands, and other lands allocated to nontimber uses.	Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities.	Retain all existing and designate all potential ACECs.	Same as Alternative D.

	All Common Alternatives	Alternative A
Issue No. 6: Visual Resources Which, if any, areas of BLM lands should be managed to reduce visual impacts or enhance visual (scenic) quality?	Note: Guidance for Issue 11 (Rural Interface Area Management) also addresses and defines visual resource management for Alternatives B, C, D and E in rural interface areas, except where this Issue 6 guidance sets a higher standard of visual resource management. Guidance for Issue 9A (Wild and Scenic Rivers) establishes criteria that will substantially dictate visual resource management by alternative in proposed wild and scenic river corridors. See Issue 9A and Issue 11 guidance for details.	Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage all other available (for timber harvest) forest land under VRM Class IV management objectives. Manage other lands as inventoried.
Issue Nos. 7 and 8: Stream/Riparian/Water Quality Where and how should riparian zones be managed to protect and improve water quality, fisheries and wildlife habitat? What actions should be undertaken to comply with state water quality standards? What should BLM do to manage for special needs such as municipal and domestic use?	Guidance for All Common Alternatives: Establish Riparian Management Areas (RMAs) on perennial streams (generally, 3rd order and larger streams), lakes, ponds and other waters, to meet Oregon Forest Practices Act requirements and Oregon water quality standards. Typical average widths of RMAs by alternative are displayed in Table 1. Within those RMAs no lands would be considered "available" (to offer timber for sale as part of the allowable sale quantity). Some timber harvest may occur, however, to achieve resource management objectives. These activities may include road construction and yarding corridors across streams and riparian zones to facilitate timber harvest outside the RMA. Logging, road building and site preparation methods would be designed to minimize the number and/or size of mass soil movements and to maintain the integrity of the RMAs. Other activities such as mining, recreation and ORV use would be regulated to protect water quality. Stream and riparian habitat improvement measures may be taken on any streams to improve water quality, fish habitat and/or wildlife habitat. Activities would be designed to meet Oregon Forest Practices Act (OFPA) requirements and Oregon water quality standards. Protect wetlands in accordance with Executive Order 11988 and 11990. Comply with written agreements with public water systems serving municipalities.	
Issue No. 9: Recreation Resources What areas or sites should be designed and/or managed to protect or enhance a variety of recreational opportunities?	Manage for dispersed recreation activities consistent with managed forest settings, including hunting, fishing, sightseeing, riding/hiking, and rafting. Maintain and manage existing recreation facilities which make available significant dispersed recreation opportunities, including recreation sites, boat ramps, trails, interpretive signs and related improvements. Manage existing Special Recreation Management Areas (SRMAs) and delineate Extensive Recreation Management Areas (ERMAs).	Manage existing high-use recreation sites and trails and expand them where needed. Close low use recreation sites and trails. Designate lands open to off-road vehicles (ORV) and leave roads open to motorized use, except where such designation would conflict with other allocations.

Alternative B	Alternative C	Alternative D	Alternative E
Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage as inventoried all available forest land adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways, and rivers designated under the federal Wild and Scenic Rivers Act. Manage all other available forest land under VRM Class IV management objectives. Manage other lands as inventoried.	Same as Alternative B, except on available forest land where BLM-administered land makes up more than half of a viewshed, manage lands as inventoried.	Manage all lands as inventoried.	Same as Alternative D, except manage as VRM Class III all BLM-administered lands inventoried as Class IV; and manage as VRM Class I BLM-administered lands adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways and rivers designated under the federal Wild and Scenic Rivers act.

Table 3-1. Riparian Management Areas

Stream Order	Average RMA Width* (each side of the stream in feet) ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
1					50
2				60	60
3	75	75	105	140	200
4	75	100	150	200	200
5	75	140	210	280	280
6	75	160	240	320	320
Lakes, Ponds & Other Waters	75	100	150	200	400

* Actual RMA widths would be determined by on-the-ground riparian vegetation, terrain and stream characteristics, but would be a minimum of 50 feet on all 3rd order and larger streams. First and second order streams would have RMAs designated if perennial or if the beneficial uses warrant.

Same as Alternative A, except support the State's Regional Economic Development Plan for the geographic area, retain options for new SRMAs and high value potential recreation sites and trails on Public Domain lands, maintain and/or improve all existing developed recreation sites, and consider reopening sites closed in recent years.	Allocate and manage new SRMAs. Continue management of all existing recreation sites and trails, and consider reopening sites closed in recent years. Emphasize wildlife viewing, interpretation and related old-growth forest recreation opportunities, both to attract nonlocal visitors and to serve local users. Retain options for future development of high value potential sites, trails and sightseeing opportunities. Impose additional ORV limitations or road closures to protect wildlife habitat or old-growth forest recreation opportunities, minimize conflicts with hikers and horseback riders, or meet other resource objectives.	Same as Alternative C, except manage for an optimum range of nonmotorized recreation. Retain options for future development of recreation sites and facilities for dispersed recreation opportunities. Retain existing pockets of old-growth forest that are both adjacent to and accessible from existing or potential recreation areas. Prohibit ORV and road use as appropriate to improve wildlife habitat or protect the ecosystem.	Same as Alternative D.

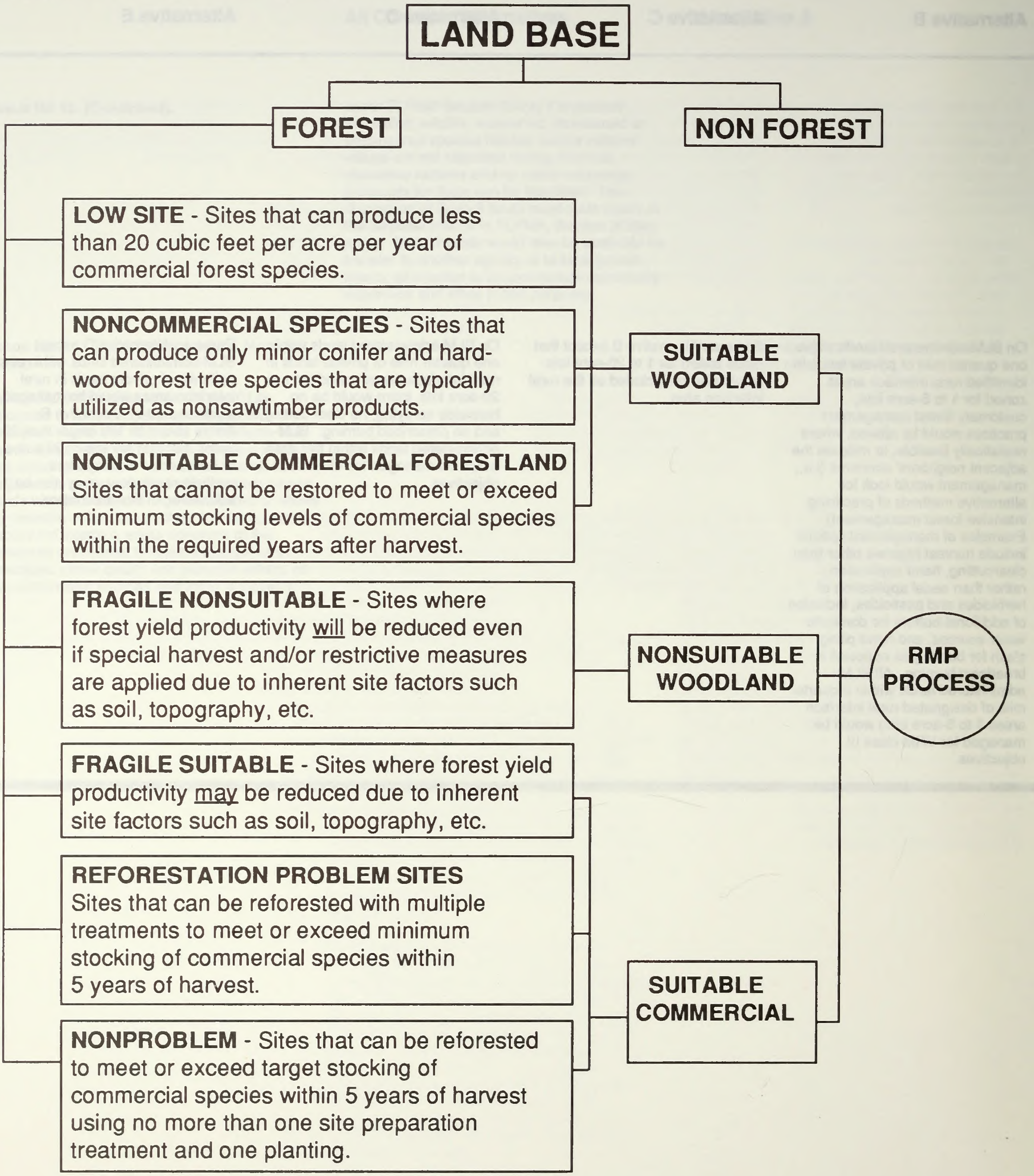
	All Common Alternatives	Alternative A
Issue No. 9A: Wild and Scenic Rivers What, if any, rivers should be found suitable for designation?	Provide interim protection for all river segments determined to be suitable, until Congressional action on BLM plan recommendations. Interim protection should be appropriate to the highest category for which the river is determined to be suitable. Manage Congressionally designated rivers consistent with their designation.	No rivers found suitable for designation under any classification.
Issue No. 10: Land Tenure In what areas would BLM-administered lands be sold, exchanged or transferred out of federal ownership under other authorities to improve management efficiency and benefit resource program objectives? In what areas would BLM attempt to acquire lands to improve management efficiency and benefit resource program objectives?	A major lands program effort would use exchanges to consolidate land ownership patterns to benefit one or more of the resources managed, such as timber, watershed, wildlife habitat, recreation, cultural, botanical, and minerals. Land tenure adjustment would be guided by a three-zone concept utilizing the following standards: Zone 1 includes areas currently identified as having high public resource values, and other efficiently managed lands. The natural resource values may require protection by federal law, Executive Order or policy. These lands may have other values or natural systems which merit long term public ownership. They do not meet the criteria for sale under FLPMA Section 203(a) and would generally be retained in public ownership. The Zone 1 boundaries should be relatively close to or on BLM property lines except where the intent is to show preferred acquisition areas. Zone 2 includes lands that are suitable for exchange because they form discontinuous ownership patterns, are less efficient to manage than Zone 1 lands, and may not be accessible to the general public. Where appropriate opportunities are identified, these BLM-administered lands may be exchanged for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management. These lands would not be expected to meet the criteria for sale under Section 203(a), and would not be identified as suitable for such sale. Zone 3 includes lands that are scattered and isolated with no known unique natural resource values. Zone 3 lands are available for use in exchanges for private inholdings in Zone 1 (high priority) or Zone 2 (moderate priority). They are also potentially suitable for disposal through sale	Exchanges would be made to acquire lands which would enhance the nondeclining harvest level of the commercial forest land managed by BLM, by improving age class distribution or other harvest level determination factors. Factors to consider include site quality, access to public forest land, logical logging units, and management of public forest land to facilitate timber harvest. No exchanges would be made to acquire lands more valuable for nontimber uses. No commercial timberland would be sold or leased. Leases or conveyance of land in Zones 2 and 3 other than commercial timberland would be made under the Recreation and Public Purposes Act to provide appropriate facilities or services.

Alternative B	Alternative C	Alternative D	Alternative E
No rivers found suitable for designation as wild or scenic. River segments eligible for wild, scenic or recreational classification found suitable for designation as recreational, if all of the following circumstances exist: - no net adverse economic impacts on the local economy. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be the top river in the State Comprehensive Outdoor Recreation Plan (SCORP) region. - BLM can effectively manage the outstanding values of the river segment.	River segments eligible for scenic or recreational river status found suitable for designation consistent with their highest potential classification, and river segments eligible for wild classification found suitable for designation as scenic, if all of the following circumstances exist. If only the economic impact test is not met, find suitable for designation as recreational. - no net adverse impacts on the local economy. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top two rivers in the SCORP region. - BLM can effectively manage the outstanding values of the river segment.	Eligible river segments found suitable for designation consistent with their highest potential classification if the following circumstances exist. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top four rivers in the SCORP region. - BLM can effectively manage the outstanding values of the river segment.	All eligible river segments found suitable for designation consistent with their highest potential classification.
Exchanges of O&C and CBWR lands would be made primarily to acquire lands which would enhance timber management opportunities. Exchanges of public domain lands would be made to benefit one or more of the resources managed, including nontimber values. Sale of O&C and CBWR lands other than available commercial forest lands, and of public domain lands, would be made to dispose of lands that meet any of the criteria of FLPMA Section 203(a). Leases on such lands would be made to accommodate other uses. Leases or conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide appropriate facilities or services.	Same as Alternative B, except emphasis would also be given to exchanges of O&C and CBWR lands that would contribute to conservation of biological diversity.	Land exchanges would be made to benefit one or more of the resources managed. Exchanges involving disposal of timber to acquire lands containing greater nontimber values would be emphasized. Sales of lands other than available commercial forest lands would be made to dispose of lands that meet criteria (1) or (2) of FLPMA Section 203(a), but sales of land that meet only criterion (3) would not be made. No lands would be leased, except leases and conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide facilities or services for the benefit of the public.	Same as Alternative D.

	All Common Alternatives	Alternative A
Issue No 10. (Continued).	under FLPMA Section 203(a) if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified. The discussion of Zone 3 lands must state which of the disposal criteria in FLPMA, Section 203(a), apply. Zone 3 lands would also be available for transfer to another agency or to local governments, as needed to accommodate community expansion and other public purposes.	
Issue No. 11: Rural Interface Area Management Which BLM-administered lands should be allocated to receive special management practices due to the concerns of residents who live in close proximity? (Rural interface areas are areas where BLM-administered lands are adjacent to or intermingled with privately owned lands where county zoning has created or allows for creation of lots as small as 1 to 20 acres. In most rural interface areas concerns of the residents are related to forest management practices, visual quality and potential affects on domestic water sources and water supplies.)		No special management actions except those that address other issues.

Alternative B	Alternative C	Alternative D	Alternative E
On BLM-administered lands within one quarter mile of private lands in identified rural interface areas zoned for 1 to 5-acre lots, customary forest management practices would be altered, where realistically feasible, to mitigate the adjacent neighbors' concerns (i.e., management would look for alternative methods of practicing intensive forest management). Examples of management options include harvest regimes other than clearcutting, hand application rather than aerial application of herbicides and pesticides, inclusion of additional buffers for domestic water sources, and hand piling slash for burning as opposed to broadcast burning. All BLM-administered lands within a quarter mile of designated rural interface areas 1 to 5-acre lots) would be managed for VRM class III objectives.	Same as Alternative B except that lands zoned for 1 to 20-acre lots would also be included as the rural interface area.	On BLM-administered lands within one quarter mile of private lands in rural interface areas zoned for 1 to 20-acre lots, there would be no herbicide spraying, no clear cutting, and no prescribed burning. BLM-administered lands within this area would be managed for VRM class II objectives.	Same as Alternative D except BLM-administered lands within one half mile of private lands in rural interface areas would be managed as discussed in Alternative D. Areas zoned for lots larger than 20 acres, but with tax lots of 20 acres or less and/or existing legal multiple residences, may also be addressed in this alternative.

Figure II-B-1. TPCC Categories


LAND BASE
FOREST
NON FOREST
LOW SITE - Sites that can produce less than 20 cubic feet per acre per year of commercial forest species.
NONCOMMERCIAL SPECIES - Sites that can produce only minor conifer and hardwood forest tree species that are typically utilized as nonsawtimber products.
NONSUITABLE COMMERCIAL FORESTLAND Sites that cannot be restored to meet or exceed minimum stocking levels of commercial species within the required years after harvest.
FRAGILE NONSUITABLE - Sites where forest yield productivity will be reduced even if special harvest and/or restrictive measures are applied due to inherent site factors such as soil, topography, etc.
FRAGILE SUITABLE - Sites where forest yield productivity may be reduced due to inherent site factors such as soil, topography, etc.
REFORESTATION PROBLEM SITES Sites that can be reforested with multiple treatments to meet or exceed minimum stocking of commercial species within 5 years of harvest.
NONPROBLEM - Sites that can be reforested to meet or exceed target stocking of commercial species within 5 years of harvest using no more than one site preparation treatment and one planting.
SUITABLE WOODLAND
NONSUITABLE WOODLAND
RMP PROCESS
SUITABLE COMMERCIAL

Appendix II-C

Best Management Practices for Maintaining Water Quality and Soil Productivity

The "Best Management Practice" (BMP) concept used in this plan to protect water quality and maintain soil productivity was developed and first used in federal water quality legislation. Implementation was designed to be at the state level. The Oregon Department of Environmental Quality (DEQ) has granted the BLM Designated Management Agency status thereby making BLM responsible for implementing BMPs on the lands it administers. The BLM is also guided by the Clean Water Act of 1972 as amended in 1985 and 1987, and state of Oregon water quality legislation (chapter 340), as well as the O&C Act. These BMPs are designed to comply with Oregon Forest Practices Act standards.

All alternatives would utilize the BMPs identified in this Appendix or their equivalent. The soil and water protection measures described below are types of controls that would be used to protect soil productivity and maintain water quality and dependent beneficial uses. Monitoring will be required to ensure that the BMPs are accomplishing their intended objectives and if not, BMPs changed so the objectives are met. The following list of BMPs is not intended to be all inclusive nor replace site-specific project planning, which may require the use of different or additional mitigating measures.

Goals: (1) Maintain water quality within State Water Quality Standards and Clean Water Act requirements while meeting other resource objectives; (2) Manage soil productivity at or above natural levels.

Soil and Water Planning and Management

1. An interdisciplinary (ID) team, which will include a soil scientist and/or a hydrologist, will review all proposed activities that have potential to adversely impact soil or water. Soil and water protection will be an integral part of all plans. If necessary, plan modification or additional mitigation will be used to keep impacts to an acceptable minimum.

2. Watershed improvement planning will be done to restore impaired watershed function and to improve water quality. An inventory and implementation schedule will be developed as funds become available.

3. A floodplain and wetland evaluation will be completed prior to any land disposal by sale or exchange, or where development or alterations of wetlands may occur.

4. Construction in, or change of, floodplains and wetland character will not occur when there is a viable alternative that avoids these important lands, unless done for enhancement purposes.

5. Community and noncommunity domestic supply watersheds will be managed for multiple use, but with a special emphasis on protection of water quality consistent with state standards.

6. Pesticide applications used for growing, harvesting, and protection of forest tree species will be in conformance with BMPs identified in the ROD for Management of Competing Vegetation, Appendix I-C.

7. Care will be taken in siting of temporary camps, and proper waste disposal procedures will be used, to avoid contamination of water.

8. Following wildfires, a rehabilitation plan will be developed using the ID team process. Site-specific information will be collected, and treatments developed based on soils, water, and downstream values.

9. A plan for hazardous substance spills will be developed and updated annually for spill prevention and control.

10. Ongoing activities may be interrupted or halted at the discretion of the District or Area Manager for soil and water protection purposes.

Streams and Riparian Management Areas (RMAs)

1. RMAs would be designated along third order and larger streams, lakes, and other waters for protection of riparian areas and water quality.

2. Naturally-occurring down logs or trees will not be removed from RMAs except for the benefit of the stream or RMA.

3. Timber will be directionally-felled or line-pulled away from streams or RMAs when harvesting within a tree length of either, except to enhance stream structure by felling trees into the stream.

4. Stream crossings will be minimized and located where channels are well- defined, unobstructed, and straight. Crossings will be designed to minimize soil erosion, stream sedimentation, and adverse impacts on aquatic habitat.

5. The use of heavy equipment in streams will be restricted to that area necessary for correct installation of crossing structures, water source development, watershed improvement, or fisheries enhancement projects.

6. When possible, streams will be diverted around construction sites where fishery or other important stream values are present.

7. Culverts or pipe arches will be placed at 0 to 0.5 percent, or natural stream grade, on valuable fish streams.

8. Rip-rap, or other energy dissipation material, will be placed on fills around the inlets and outlet structures.

9. Filling, removal of materials, or relocation of channels will not be allowed in fish-bearing streams unless no other alternative exists, except for stream rehabilitation projects.

10. In-stream habitat improvement structures will be designed using state-of-art techniques, and will be in balance with local stream hydraulics.

11. Low water fords will be used only as a last resort, and then during the driest time of the year with minimum streambank disturbance. Rocked approaches and erosion control practices will be used during and following any use of fords. The natural drainway will be reconstructed following use.

12. Refueling, maintenance of equipment, fuel storage, or other handling of petroleum products will not occur in RMAs.

13. Placer mining claimants will be required to obtain all necessary state and federal operating permits before beginning work.

Road and Landing Construction

1. Road and landing construction activities will be limited to the dry season, generally from June into October.

2. Roads and landings will be designed and constructed to high standards, but be the narrowest and smallest sizes that will still meet safety standards, objectives of anticipated uses, and resource protection.

3. Roads and landings will be located out of RMAs to the extent possible.

4. Roads will be located on stable locations as much as possible (i.e., ridge tops, stable benches or flats, and gentle to moderate side-slopes). Grades will be rolled (varied) to maintain stable locations. Headwalls, old slump benches, seeps, and side slopes in excess of 65 percent will be avoided as much as possible. Heights of cutbanks will be minimized, and balanced earthwork will be used.

5. Road construction on slopes where geologic bedding planes are inclined with the slope will be avoided as much as possible.

6. The theoretical 50-year flood will be used as design criteria for culverts with end area 35 square feet or greater, and the theoretical 25-year flood as design criteria for culverts with less than 35 square feet end area.

7. To minimize sidecasting waste material, 100 percent end-haul (90 percent or greater actual) will be required where roads and landings must be located on side slopes exceeding 60 percent. On all road segments requiring end-haul, a tracked excavator will be preferred for pioneering and main excavation work. Other equipment capable of achieving this goal may be utilized. Pioneer work will be confined to within roadway construction limits.

8. Stable end-haul (waste) sites will be located prior to end-hauling. These sites will be kept properly shaped, drained, and vegetated.

9. Controlled blasting techniques that minimize the amount of soil/rock displaced from the road location will be used.

10. Only soil and rock materials will be used in fills. Organic materials will not be used. Fills will be compacted to 85 to 95 percent maximum density. Light-weight fills consisting of chips, bark or other material may be used in areas where rotational slumps may cause road failures.

11. Road drainage will be designed to minimize soil erosion and stream sedimentation. Energy dissipators, culvert down pipes, or drainage dips will be used where water is discharged onto loose material, and erodible or steep slopes.

12. Road surface shape (i.e. crowning, in-sloping, and out-sloping) that meets planned use and resource protection needs will be used.

13. New roads to be included in the permanent road system will normally have a rock surface applied. Those new roads having a natural surface (generally roads in Curry County) may have the dirt surface seeded, mulched and fertilized.

14. New roads not included in the permanent road system will be restored on completion of use. The road surface will be seeded and mulched, stream crossings restored, and the road generally blocked from further use. These roads may also be obliterated through use of a winged ripper during the driest part of the year.

15. Following use of landings that have side slopes exceeding 60 percent, all soil, rock, and cull woody debris material that has been pushed over the edge will be pulled back to a stable part of the landing surface.

16. Soil erosion control work will be completed the same season disturbance occurs, using the district seed mix. Seed and fertilizer will be applied during the optimum time for establishment and prior to winter rains, primarily September 1 to October 30, and secondarily March 15 to May 15.

17. Drainage and soil erosion control practices will be applied to renovated or reconstructed roads in the same manner as newly constructed roads.

18. Road maintenance activities will be planned to minimize soil erosion and subsequent stream sedimentation. Heavy equipment will be used to clean ditches, but only when necessary. Undercutting of backslopes will be avoided. Bare soil created by maintenance activities will be protected from soil erosion as soon as possible.

19. Sloughed cutbank materials will not be sidecast onto slopes greater than 60 percent, or into or near drainages. This material will be end-hauled to a stable site.

20. Low growing herbaceous ground cover will be retained on cut and fill slopes unless it poses a safety hazard.

21. Permanent, effective drainage will be provided on roads that are closed but not totally reclaimed. Waterbars, dips, or out-sloping will be used and the natural drainway re-established.

Timber Harvest

1. Timber sale units will be designed to minimize adverse impacts on soils and water. The sale contract will contain stipulations for protection or mitigation. All perennial streams and other water features will be shown on planning and contract maps.

2. Yarding through RMAs will be avoided unless there is no feasible alternative. The location, number, and width of corridors will be specified prior to yarding, and natural openings will be used as much as possible. Not more than 250 feet of yarding corridors would be allowed within any 1,000 feet of stream. Maximum corridor width will be 50 feet, and corridors will be at least 50 feet apart. Full log suspension will be used where feasible.

3. Cable yarding, preferably with partial log suspension, will be the preferred standard method for log yarding on all district lands.

4. Cable systems, capable of at least partial log suspension, will be required to yard all lands inventoried as FGR1 in the TPCC system.

5. Aerial systems, or skyline cable systems capable of full log suspension, will be required to yard all lands inventoried as FGR2 in the TPCC system.

6. Seasonal yarding restrictions will be used in some areas where the desired log suspension cannot be achieved.

7. Downhill yarding will be avoided unless used to prevent additional or difficult road or landing construction.

8. Concentrations of logging slash will be removed from all streams prior to fall rains and placed above the high water mark, unless pieces are specifically designated for retention.

9. Ground-Based Yarding Systems

   a. If tractors or rubber tired skidders are used for log skidding, skid trails will be designated with the objective of having less than 12 percent of a harvest area affected by compaction. Existing skid roads will be used to the extent practical.
   b. Tractors or rubber tired skidders will be restricted to slopes of less than 35 percent and used only during the driest part of the year typically mid-July to mid-September.
   c. Other ground-based yarding systems (i.e., spider-walkers, feller bunchers) may be used on slopes over 35 percent, provided there would be insignificant growth-loss effect and that skid trails involve less than 12 percent of harvest area.
   d. Following use, skid roads that will not be used for future entries will be ripped using a winged subsoiler at the optimum time and the land returned to timber production.
   e. Skid trails that will be used for future entries will be considered as part of the district road network.
   f. Drainage and erosion control measures, including water barring of skid trails, will be applied to bare soil areas, following use and prior to winter rains.

Silvicultural Operations

1. Open water, RMAs, and wetlands will be protected during application of fertilizer. Buffers will be planned along all perennial streams that have domestic use, support fisheries, or have other important uses. Application will be avoided during heavy rain or when wind speed could cause drift. Storage, transfer, and loading sites will be located away from streams and outside RMAs.

2. Where burning is necessary for site preparation, site-specific prescriptions will be used.

3. Burning prescriptions will be strictly adhered to on highly sensitive soils. These are shallow, rocky soils on 70 percent or greater slopes with south or west aspect, and out of the "fog belt"; and the same kinds of soils on extremely steep (80 percent or greater), and north and east aspects in the drier parts of the district.

4. As much large down woody material will be left on-site as possible while still meeting site preparation needs. Gross yarding will be used on steep headwalls and deep V-shaped draws to decrease or break up logging debris concentrations, reduce fire intensity, and minimize potential debris torrent damage. Old embedded logs or other logs that contribute to bank stability will not be removed.

5. Where machine piling of logging debris is used, first preference will be given to low ground pressure backhoe/loader/grapple type equipment. If conventional tractor piling is used, brush blades will be required, and piling will be done under strict soil and water protecting constraints. Any machine piling will be done during the driest part of the year, and compacted areas would be tilled with properly designed equipment.

6. Use of tractors for fireline construction will be limited as much as possible, and tractors will be restricted to slopes less than 35 percent. Tractor-constructed fire trails will be waterbarred.

7. Grass/legume seeding of units will be done to protect highly erosive soils following burning. This will be coordinated and reconciled with wildlife and silvicultural objectives.

Appendix II-D

Selection of Harvest Scheduling Model and Allowable Sale Quantity Calculation Process

Early in the planning effort, in 1986, BLM began exploring the available model options for timber harvest scheduling. These models consider timber production capability, operations inventory, and forest plot data for a given land base according to alternative timber management prescriptions to determine potential annual timber harvest levels and their sustainability over the long term.

The model most relevant to BLM's needs was TRIM-PLUS, a binary search type model that functions much like the SIMIX model used by the BLM to generate Allowable Sale Quantities (ASQs) in the previous two decades. In the spring of 1987, BLM held public workshops in some of BLM's western Oregon offices to explain the TRIM-PLUS concepts. After considering comments, and testing the model on data from the late 1970s, BLM selected the TRIM-PLUS model for the 1990s RMP.

The TRIM-PLUS model was identified as the optimal approach for BLM because of its capabilities to do the following:

- Be accessible at the district level.
- Calculate individual non-declining harvest levels on multiple minimum harvest ages.
- Process various land use classes simultaneously.
- Provide enhanced report generating and graphics capabilities.
- Provide simplified input/output data (ease of use).
- Provide relatively inexpensive computer runs.

Although harvest scheduling models of various degrees of complexity were considered, the intent was to identify a relatively simple and reliable state-of-the-art system. BLM wanted to be able to interface the selected model with other specific resource analysis models/procedures such as an elk habitat model which will use our automated (mapped) resource data base. This process will identify different land use allocations in terms of acres and the model will reflect resulting harvest level impacts in a trackable fashion. TRIM-PLUS also has the capability to optimize investment levels.

The Allowable Sale Quantity Process

Calculation of Allowable Sale Quantity

The Allowable Sale Quantity (ASQ) refers to the maximum non-declining level of timber harvest sustainable over time. Estimated ASQs and harvest scheduling are derived through the TRIM-PLUS system by specifying current acreage, current volumes, and future management assumptions. ASQ volumes from TRIM-PLUS are in merchantable cubic feet. Equivalent estimates in board feet are provided to help interpret the information.

Current Acres

The derivation of current acres involves using the digitized (computerized) GIS map overlays and MICRO*STORMS data storage.

GIS Map Acres

Acres for the AMS were derived from digitized (computerized) GIS map overlays, with a separate map for each topic or theme addressed in the AMS. These maps can be overlaid or merged to allow analysis and generation of acres.

MICRO*STORMS Data Base

After being determined through GIS, acreage information is stored in a large relational data base called MICRO*STORMS. In this system, data is separated into three primary files, as follows:

File Name	No. Records	Description of File Contents
Site	6,432	Acreages, timber type, site, treatments
TPCC	2,800	Timber productivity classification
CFI	308	5-point plot data

Within each file is a separate record of information for each plot or unit of land within the planning area. Each record contains many kinds of data. For example, the record in the Site File contains data on the Basic Resource Unit, Existing Stand Condition, acreage, timber type, site index, past and recommended treatments, timber volumes, stand age, and land use. Selected information from the three files are linked to the digitized (GIS) maps.

Basic Resource Units

Within TRIM-PLUS, data is segregated by resource area, site index, land status, and kind of management or timber type. These groups of data are called Basic Resource Units (BRUs). The ASQ and other output data from TRIM-PLUS is reported by BRU and for groups of BRUs, as well as for the entire sustained yield unit. A total of 35 BRUs have been established for the district.

Existing Stand Conditions

Existing Stand Condition (ESC) codes are assigned to each BRU. ESC codes help to group, sort and track similar kinds of stands, and help place units of land into the proper BRU. This sorting is accomplished by giving each MICRO*STORMS Site File record an ESC code from the following list that best describes the forest.

Existing Stand Condition Codes

Code	ESC Description
1	Fully stocked second-growth (III-bar stocking)
2	Medium minimum stocked second-growth (II-bar stocking)
3	Below minimum stocked second-growth (I-bar stocking)
4	Recommended for precommercial thinning
5	Planted with genetically improved stock
6	PCT'ed and fertilized stand
21	PCT'ed only stand
22	Hardwood Conversion recommended
23	Hardwood stand with conversion not recommended
40	Other stands 36-500 years old and not previously harvested
50	Brushfield/Backlog conversion recommended
51	Non-commercial conifer stand - no conversion recommended
60	Sold but not yet reforested
70	Recreation/other reserved lands (not included in TRIM-PLUS)
99	Nonforest (these are not included in TRIM-PLUS)

Current Volumes
5-point Forest Inventory

Tree volumes on present stands are derived from 308 permanent inventory plots distributed throughout the planning area. Both conifers and hardwoods were cruised by certified BLM cruisers to the same standards used in timber sale preparation.

Cubic foot volumes were computed from the inventory data using a BLM software program called UNIT1. Summary plot data is stored in the MICRO*STORMS data base file called CFI. These data include general site descriptors, board foot and cubic volume, growth, basal area, trees per acre, and average DBH and tree heights.

Empiric Yields

In contrast to yields from published stand tables or computer models, empiric yields are derived from existing plots. Empiric yields are preferred over published yield tables wherever sufficient plot data exists to build the yield curve.

A natural logarithmic regression was used to estimate empiric yields. The form of the model is:

GCACR = exponent $(B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4)$
Where GCACR = Gross Cubic Volume per Acre
X_1 = Site Index
X_2 = $1/\text{Age}^2$
X_3 = 1/Age
X_4 = $(\text{Hardwood Volume} + 1)^2$
B = The numeric value of each variable

For all sites, empiric yield curves were generated for both managed and unmanaged conifer stands and hardwood conversion stands. For precommercially thinned stands, empiric yields were calculated to stand age 50, the upper limit of available plot data.

Future Management Assumptions

Some assumptions about future management that directly affect the ASQ runs in TRIM-PLUS include the: minimum harvest age, regeneration lag, future stocking levels, anticipated gains for planting genetically selected stock, the frequency and acres of precommercial thinning, commercial thinning and fertilization, and the stand age when these treatments are applied. Details of these assumptions are available at the district office.

BRU Management Intensity (MI) Levels

Within each BRU in TRIM-PLUS, there are eight slots called MIs that can be used to simulate various management assumptions or intensity levels. Each MI requires information about yields and acres by age class, and about acreage shifts from one MI to another during growth and at final harvest. Specific configuration of the MIs varies within each BRU; however, the general configuration for all BRUs is as follows:

MI	Description
1	Below minimum stocked stands and hardwood conversion stands
2	Medium stocked stands, fertilized
3	Fully stocked stands, fertilized
4	Phase I genetic acres, fertilized
5	Phase I genetic acres, precommercial thinning and fertilized
6	Phase II genetic acres, fertilized
7	Phase II genetic acres, precommercial thinning and fertilized
8	Phase II genetic acres, commercial thinning and fertilized

Most present district acres are in MI2 and MI3. In future decades, acres will gradually be shifting to MI4-MI5, and eventually to MI6, MI7, and MI8. A more detailed description of these MIs and assumptions are available at the district office.

Stand Projection System and Future Yields

As noted previously, most yields for MI1 to MI3 are empiric. Yields for MI4 to MI8 are estimated using the Stand Projection System (SPS), a computer program that simulates the growth and development of forest stands. The model is primarily designed for Douglas-fir or western hemlock stands, but will also simulate hardwoods and other species. Site index, fertilization, thinning, stocking levels, stand clumpiness and economics are some of the variables that SPS can use in making yield projections. The BLM version of SPS incorporates volume regressions and cruising standards from each western Oregon BLM district.

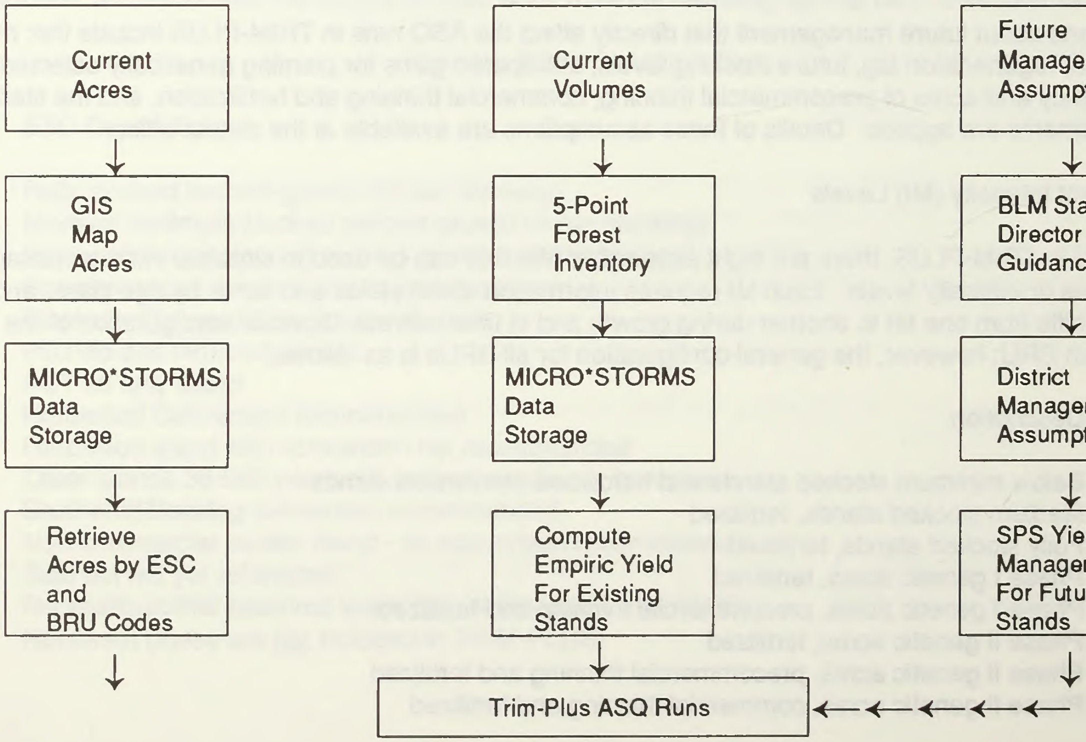
All SPS yields are gross volumes. Net volumes are derived by adjusting SPS yields for defect and breakage based on data from second-growth stands. A series of SPS runs were made to determine what combinations of intensive practices give the best yields. For example, on site 125, a PCT at age 10, CT at age 40, and fertilizations at ages 11, 26 and 41 gives maximum yield.

Gains from the genetic tree improvement program have been calculated by the district geneticist. To incorporate these gains into TRIM-PLUS, the SPS runs for MI4 to MI8 were adjusted upward by raising the site index until volume matched the anticipated height gain from planting improved stock. Details of this procedure are also available at the district office.

TRIM-PLUS ASQ Runs

When all of the acres, volumes, and management assumptions are assembled in the appropriate files in TRIM-PLUS, interactive ASQ runs are made to find the optimal harvest level. Output summaries are reviewed to assure that the output is correct and reasonable. After the total ASQ run is completed, further analysis of the contribution of each BRU, resource area, or land status can be made. Figure II-D-1 indicates the principal components and sequence in preparing an ASQ run.

Figure II-D-1. ASQ Flowchart


Current Acres
GIS Map Acres
MICRO*STORMS Data Storage
Retrieve Acres by ESC and BRU Codes
Current Volumes
5-Point Forest Inventory
MICRO*STORMS Data Storage
Compute Empiric Yield For Existing Stands
Future Management Assumptions
BLM State Director Guidance
District Management Assumptions
SPS Yields & Management For Future Stands
Trim-Plus ASQ Runs

Alternative D - Harvest Scheduling Model

The spatial constraints of the 50-11-40 rule in Alternative D do not permit the use of TRIM-PLUS, the harvest scheduling model that was applied to all other alternatives. Under the 50-11-40 rule of Alternative D, timber harvest would only occur in a quarter township where 50 percent of BLM-administered land outside spotted owl habitat conservation areas (HCAs) are in stands of conifers averaging 11 inches in dbh and having a 40 percent canopy closure. As configured, TRIM-PLUS cannot track the decadal changes associated with growth and harvest specific to meeting the 50 percent threshold by quarter township.

To meet analysis needs for Alternative D, the BLM developed a simple harvest scheduling model within the forest stand database MICRO*STORMS to track the spatial constraints of 50-11-40.

The MICRO*STORMS Database contains the basic stand information needed to estimate the initial inventory status for every quarter township within an SYU. For each quarter township, MICRO*STORMS identifies the age class distribution for areas lying both in and out of the intensive forest land base. This age class distribution is further subdivided into acreage above and below 40 percent crown closure. Stands that are 40 years or older are assumed to meet the 11-inch requirement of the rule. The database also identifies the land base (i.e., lands categorized as nonforest, and HCAs 1 and 2) within each quarter township that are not subject to the 50-11-40 rule.

The acreage meeting the 11-inch dbh with 40 percent crown closure criteria above the 50 percent threshold (e.g. the acreage available for harvest) is identified by quarter township. Next, an 80-year rotation constraint is applied on the intensive land base within each quarter township. Then, a harvest level is determined for a quarter township for any given harvest period by comparing the available acreage above the 50 percent threshold to that available by the rotation constraint and selecting whichever offers the least harvest volume.

In the MICRO*STORMS model, which uses a single production function, each age class is assigned one average volume. These volumes are recalculated as the model progresses through time to approach normality. The model harvests the oldest age class first and assumes a three-year regeneration lag. As the model progresses through each decade, the acreage meeting the 11-inch and 40 percent criteria in excess of the 50 percent threshold is recalculated to determine the harvest level for each quarter township.

The Allowable Cut Effect (ACE)

The forest is composed primarily of old-growth and recently cut-over stands which exhibit a relatively low average annual growth. This low growth is attributed to slow or negative growth of the old stands and the fact that growth is not measurable (in end-product terms) in young stands until they reach 20 or 30 years of age. Such a forest is in transition from an unmanaged to a managed or regulated state. In the classical sense, the regulated state is achieved when average annual harvest and growth are in equilibrium. At this point, maximum yield on a sustainable basis is reached. To compute an allowable cut on a forest in the transition state using this criteria would be extremely conservative and greatly lengthen the time until the regulated state was achieved. The BLM uses an alternative approach which projects growth into the future based upon assumptions about management levels and utilizes excess harvest age timber to bridge the time gap until the ultimate growth level is achieved. This process of taking credit now for future growth increases that are expected to result from management has been termed the "Allowable cut effect" (ACE).

The assumptions that contribute to the ACE vary with each alternative, but include part or all of the following:

- Genetic Improvement	8 percent growth gain in Phase one plantations. 16 percent growth gain in Phase two plantations.
- Precommercial Thinning	At age 15 in Curry County; at age 10 elsewhere.
- Commercial Thinning	At age 50 in Curry County; at age 40 elsewhere.
- Fertilization	Application at ages 16, 31, and 51 in Curry County; at ages 11, 26, and 41 elsewhere.
- Conversion	Hardwoods and all backlog areas and brushfields would be Brushfield Conversion converted in the first decade; most hardwood stands would be converted in the first two decades.

Appendix II-E

Silvicultural Systems and Practices Considered In the Common Alternatives

In addition to addressing land use allocations and objectives, the RMP addresses the selection and impacts of different silvicultural systems, and also the practices used to implement those systems. This appendix details both the systems and practices considered in the common alternatives.

Silvicultural Systems

Silvicultural systems define the sequence of management practices over the life of stands in managed forest landscapes. These systems are designed for the sustainable implementation of land use objectives, which may include: timber production, retention of visual quality, retention of biological diversity, creation of wildlife habitat, or maintenance of watershed condition. They are also designed to be consistent with the current conditions, physical site characteristics, and ecosystems of the lands to be managed. Silvicultural systems must be reasonable, implementable, and economically feasible.

In development of the RMP, two general silvicultural systems were designed to meet the objectives of each alternative:

- Even-Aged Systems, and
- Structural Retention Systems

Both of the general silvicultural systems were designed to move stands from their current condition toward a desired or "target" stand condition. Target stand conditions include even-aged, high volume stands in the case of even-aged systems, and ecologically diverse stands in the case of structural retention systems. Each silvicultural system consists of three phases: (1) stand regeneration, (2) stand management, and (3) stand harvesting.

Several formulations of each general system were developed for different levels of management intensity, varying rotation lengths, and different developmental trajectories for each stand.

Design and Selection of Silvicultural Systems

Silvicultural systems are designed at a general level for the planning process and at a more detailed, site-specific level for individual forest management actions. At both levels, the design process follows the same steps.

The initial step in preparing silvicultural prescriptions involves consideration of land use allocations and management objectives. Current stand conditions and landscape conditions, together with physical site characteristics, usually limit the ways a stand can be managed.

Selection of a system for reaching a target stand or landscape condition requires consideration of successional pathways and functional relationships within particular plant communities. It also requires knowledge of the biological potential of the site, processes required to maintain forest health, and habitat requirements of plant and animal species. In addition, the selected system must assure that harvested land can be reforested and that the managed ecosystem is sustainable. The process that leads to successful reforestation is the most critical part of any silvicultural system.

Successful implementation of the silvicultural system, together with providing for environmental protection, is the basis for design of timber sale actions, and for selection of the logging and transportation systems.

Silvicultural system design also considers wood quality and value through features such as rotation lengths, tree pruning, and stand density regulation.

Salvage of Mortality Volume

All silvicultural systems would provide for the salvage of mortality volume under prescriptions designed to ensure that such actions meet the requirements of allocations and objectives.

Mortality in established stands results either from competition and self-thinning or from forest disturbances such as fire, windstorms, disease, or insect attack. The mortality associated with self-thinning is either harvested in commercial thinnings, or is prevented from developing through other density management and species control practices. Mortality of scattered trees or entire stands which arises from disturbances and is above the levels needed to meet excavator habitat and down woody debris requirements may be harvested in mortality salvage operations.

While forests may differ in their susceptibility to disturbance due to differences in stand age, stand condition, plant community, or physical site, all are subject to disturbance agents. Forests which have been undisturbed for long periods of time, and those which are in poor health, have increased risk to widespread mortality from insects, fire, windstorms, and disease. (Waring and Schlesinger, 1985).

Even-Aged Systems

Even-aged systems involve the management of both existing even-aged or near even-aged stands and the creation of new even-aged stands through harvesting or stand conversion actions.

The stand regeneration phase of even-aged systems includes the clearcut method, the seed tree method, the shelterwood method, and stand conversion.

Even-aged systems usually provide for some level of structural retention, including wildlife trees and down woody debris, but at levels below those detailed for structural retention systems.

Stand Regeneration

Clearcut Method

This method is an even-aged reproductive cutting method in which an entire stand, or part of a stand, is harvested in a single entry with the exception of designated wildlife trees and snags, down logs, buffer strips, or other structural features. Clearcutting permits the establishment of an even-aged stand with the fewest number of entries, and allows aerial management practices to be implemented safely and efficiently. Clearcutting favors regeneration of shade-intolerant species like Douglas-fir.

Clearcuts are usually regenerated through planting following site preparation. For the next decade and subsequent decades, clearcuts are scheduled for planting with genetically selected stock whenever it is available. Natural regeneration may occur through seed dispersal from retained green trees and trees in adjacent timber stands. The clearcut method of regeneration may be used in previously unentered stands, or in stands previously subject to management.

To secure regeneration, clearcut harvest units may require actions such as protection from animal damage and control of competing vegetation, in addition to planting.

Seed Tree Method

In this even-aged system, the entire stand or part of a stand is harvested in a single entry except for a small number of seed trees, usually 3 to 10 per acre, retained either singularly or in groups, with the objective of providing seed for natural regeneration. Artificial regeneration techniques, usually planting, may augment natural regeneration if necessary. Depending on other management objectives, the seed trees may be removed when the unit is judged to be stocked.

Shelterwood Method

In a shelterwood system, a stand is removed in a series of two or more partial cut entries designed to create a necessary level of disturbance and to provide shelter for the establishment of newly planted and natural seedlings. After establishment of regeneration, overstory trees are removed. While shelterwood units are typically planted with conifer species, natural regeneration may constitute a significant percentage of the regeneration present. Genetically-selected seedlings, when available, are scheduled for planting in shelterwoods. Research conducted under the FIR program indicates that logging damage to regeneration during the removal of the overstory is less significant than previously believed. Regeneration methods that retain a partial canopy favor shade-tolerant species.

Stand Conversion

Stand conversion is a process for removing vegetation which currently dominates a site and replacing it with species that better meet management objectives. Typically, on sites which will support commercial conifers, vegetation such as hardwoods and brush (grass and shrubs) are replaced with commercial conifer species, to meet economic or diversity objectives. Stand conversion units are scheduled to be planted with genetically-selected stock whenever it is available.

Stand Management

Following the regeneration phase, even-aged systems are subjected to treatments designed primarily to produce higher timber yields. Even-aged systems may be managed with different levels of intensity. Stands on more productive sites are planned for a higher level of management intensity than stands on lower sites. There is less return on money invested in management practices on poorer sites, and there is some uncertainty about some of the responses to treatments on poorer sites.

Stand management practices include control of species composition and stand density. Maintenance practices are employed to ensure tree survival. Release practices are employed to ensure that tree growth is not slowed by competing vegetation and that trees are not displaced by non-merchantable or lower valued plants. Density control through precommercial thinning assures that growth is concentrated in the stems of selected crop trees. Density control may also be necessary to prevent stagnation in dense natural stands, where growth rates on individual trees have been drastically reduced.

Control of stand density and species composition makes it possible to increase harvest volumes through commercial thinning. As stands age, fewer and fewer trees are required to fully occupy a site. Density control permits the growth of surplus conifers to merchantable sizes. These trees may be harvested in commercial thinnings which increase total rotation yields.

Forest fertilization may be employed to temporarily increase stand growth. Candidates for fertilization include some young stands on the district which are in poor condition due either to thinning or release being delayed, or competition from an overstory. Following precommercial thinning or release, such stands may experience significant growth retardation called "thinning shock." The severity of this retardation may be reduced through application of fertilizer. Forest fertilization may also be used to improve tree vigor. Lower site class lands tend to show a greater response to fertilization than do high site class lands.

Stand Harvesting

Stand harvesting may occur at any age above a minimum harvest age set to meet land use objectives as well as economic and logging-practicality requirements.

The sustainable harvest level is highest if minimum harvest age is set at the lowest practical age. Overtime, however, rotation lengths would approach the age of culmination of mean annual increment (CMAI). CMAI varies with site quality, the kind of silvicultural practices employed, and the timing of those practices. Within the district, CMAI occurs between 60 and 70 years of age, except in Curry County where CMAI is between 70 and 80 years of age.

The minimum harvest age may be set at an age older than CMAI to achieve higher wood quality or larger log sizes, or to produce habitat for species which inhabit later seral stages.

Structural Retention Systems

These silvicultural systems are designed to retain or recreate forest ecoystems resembling natural systems in composition, structure, and ecosystem function. Structural retention systems do not simply retain specific structural components of forest stands harvested, but are flexible to meet the requirements of stands and sites. Retained structural components including live trees, snags, and large down wood, may be clumped or distributed in various ways on the landscape. Through retention and recreation of structure, and through appropriate selection and timing of treatments, these systems attempt to retain natural ecosystem processes and habitat niches.

Structural retention systems attempt to maintain site productivity, wildlife habitat, and a high level of biological diversity in a managed landscape.

Silvicultural practices used are modifications of those used in even-aged systems, and reflect attempts to re-direct ecosystem processes rather than to replace those processes with timber-farm type management. For instance, retention of specific levels of canopy density in forests of the Douglas-fir series may have the potential to reduce the need for some vegetation control activities.

Stands which result from the use of structural retention systems will usually be multiple-canopied and multiple-aged, but will not be all-aged. These systems differ in some ways from “selection forestry,” although many elements of selection cutting are included in these systems. Classical selection methods involve removal of individual trees (individual tree selection) or groups of trees (group selection) to produce or retain an all-aged forest composed of all size classes of trees, rather than a multiple-canopied forest.

For Alternative C, levels of structural retention were designed, in addition to a method for restoring structure to even-aged stands.

High Level Green Tree Retention is a regeneration harvest designed to retain the highest level of live trees possible while still providing enough disturbance to allow regeneration and growth of the naturally occurring mixture of tree species, including shade-intolerant species.
Harvest design would also retain cover and structural features necessary to provide foraging and dispersal habitat for mature and old-growth dependent species.

Low Level Green Tree Retention is a regeneration harvest designed to retain only enough green trees and other structural components to result in the development of stands which meet old-growth definitions within 100 to 120 years after harvest entry.

Structural Restoration Management is a series of density management and regeneration actions which are designed to restore species and structural diversity to even-aged managed stands. Density management is applied to create fine-grained patch detail and to reduce stand density to levels below that normally occurring at time of commercial thinning. This results in the more rapid development of large trees and in multiple-canopy structures.

Stand Regeneration

The regeneration phase relies upon the use of both natural and planted conifer seedlings, together with subsequent stand management, to achieve a near-natural mixture of species in each seral stage. Genetically-selected stock, whenever available, would be used with wild-type stock. No yield increase would be projected.

Stand Management

Stands created under the structural retention systems receive treatments designed to meet structural and functional objectives and to meet growth objectives. Density management would be used. Forest fertilization would be used as appropriate, but, because of uncertainty of its effect on diverse stands, would not result in a claimed yield increase.

Stand Harvesting

The structural retention systems seek to retain or recreate the habitat characteristics of older forests and are managed on rotations longer than those usually employed in even-aged systems, but (with the exception of Old-Growth Emphasis Areas) shorter than the average natural replacement interval for stands. The average regeneration period is designed to occur at 150-year intervals. Harvesting is expected to occur across stands and in group selections of varying sizes, with structural components retained in the residual groups.

Silvicultural Practices

For each silvicultural system a variety of practices other than harvesting would be planned for specific periods in the rotation. Together, these practices act to keep the forest on desired developmental trajectories, speed the development of desired habitat components, increase timber yields, and improve timber quality.

While both the type of practice used and its timing vary between systems, most silvicultural systems require the full range of forest management tools and practices for their successful implementation.

Site Preparation

Site preparation procedures would be conducted to prepare newly harvested and inadequately stocked areas for the planting of a new crop of trees. Four types of site preparation treatment (prescribed fire, herbicide application, mechanical, and manual) would be utilized. BLM's Record of Decision (ROD) Western Oregon Program-Management of Competing Vegetation, 1992, and BLM Oregon Manual Supplement H-5420-1 would provide guidance for selecting site preparation treatments using an integrated vegetation management approach. (See Appendix I-C for a copy of the key elements of the ROD.) Emphasis would be placed on those techniques proven most effective in assuring seedling survival and growth. To the extent compatible with that emphasis, duff and litter would be retained.

Prevention is the preferred strategy in controlling competitive and unwanted vegetation. The goal is to prevent or reduce the need for future vegetation control by considering known ecological relationships in the site-specific timber management decisionmaking process, so that harvest activity is designed to eliminate or reduce the need for post-harvest treatment.

Prevention seeks to detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation in the forest before such vegetation interferes with the management objectives of that area or adjacent lands.

Prescribed fire, the primary method of site preparation, would be conducted in accordance with the rules and directives of the Oregon Smoke Management Plan as administered by the Oregon Department of Forestry.

Other considerations in the design and timing of prescribed fire would include expected effects on soil and biological processes, and effectiveness in fire hazard reduction and site preparation. All prescribed fire would have site- specific prescriptions designed to minimize adverse impacts on the physical and/or chemical properties of the soil, maintain site productivity, and accomplish silvicultural objectives. In most instances, prescribed fire would be avoided on highly sensitive soils (those soils recognized as unusually erodible, nutrient deficient, or having low organic matter). On other soils, prescriptions would be designed to protect beneficial soil properties and generally result in low-to-moderate intensity prescribed fires. The majority of prescribed fires would be conducted under spring-like conditions when large fuels are moist but small fuels are dry. Occasionally, to meet silvicultural objectives, prescribed fire would be conducted under summer-like conditions when fuels are dry, resulting in moderate-to-high intensity prescribed fires. All fires would be mopped up quickly.

Vegetation control techniques reduce competition for light, moisture, and soil nutrients during the tree seedling establishment period. Where considered the most appropriate treatment, herbicides would be used as approved to control grasses, forbs, brush, and noncommercial tree species, where the goal is to increase the rate of seedling survival and/or growth. Application and monitoring of effects of herbicides would be done in accordance with BLM's ROD for the Western Oregon Program-Management of Competing Vegetation, 1992.

Herbicides would be applied aerially and by several ground methods as site-specifically appropriate. The method selected would depend on safety, costs, topography, equipment limitations, target plant species and dispersion, potential environmental impacts, and biological conditions. Most aerial herbicide applications would be accomplished by helicopters equipped with systems designed to limit herbicide application to the target areas. Timing of herbicide treatment would be stringently controlled in relation to specified weather conditions such as temperature, humidity, and wind.

Spraying operations would require continuous BLM contract administration. There would be full authority for ordering cessation of operations based on adverse field conditions. Equipment and operators would be monitored frequently for compliance by field project inspectors. Only registered chemicals approved for use by BLM would be used, and their use would be in accordance with labeled instructions on the container. Handling, storage, and application of chemicals would be in accordance with the Oregon Forest Practices Act. (See Chapter 5, BLM Planning and Resource Interrelationships State and Local Government.)

Manual site preparation would consist of brush pulling or cutting, hand piling of slash for burning, and clearing of planting spots.

Mechanical site preparation would involve piling or windrowing of slash, brush, and unmerchantable stems. Track-type equipment equipped with a brush blade or grapples would be restricted to areas with suitable soil types and slopes less than 35 percent. Track-type equipment operations would meet the following minimum requirements: 1) minimize piling of large woody material; 2) avoid displacing duff layers and topsoil into piles or windrows; 3) make only two machine passes (one round trip) over the same area; and 4) operate when soil moistures maximize resistance to compaction. Preference would be given to a low ground pressure backhoe/loader/grapple or other special equipment or techniques that would result in the same insignificant (less than one percent) growth-loss, especially on soils considered unsuitable for tractor-type operations. All compacted areas would be tilled with properly designed equipment (winged rippers).

Reforestation

Planting

To achieve adequate reforestation as promptly as practical following timber harvest, harvested areas would be planted with indigenous commercial coniferous species (e.g., Douglas-fir, western hemlock, and western redcedar). Reforestation would be done generally within one year of the completion of harvesting and site preparation. Hardwoods would be encouraged on harvested sites where they would produce a higher net monetary return than conifers. Identified root disease centers would be planted with indigenous, resistant tree species.

Planting stock would be nursery grown from seed collected on sites and at elevations similar to the specific planting sites. Genetically-selected stock also would be nursery grown and would be used to the extent available, in accordance with BLM's Western Oregon Tree Improvement Plan. Broad selection of parent trees for such stock is intended to maintain genetic diversity. Initial spacing of seedlings would be determined in conjunction with planned thinning and control of competing vegetation to maximize wood production, with site resources being concentrated on individual tree growth. (See Appendix II-F for a description of the tree improvement program.)

Target stocking levels cannot always be achieved by the initial planting. Post-treatment reforestation surveys would be conducted to determine the rate of survival and need for replanting or interplanting as required to meet stocking standards.

Forest Tree Improvement

There are two integral components of the district's forest tree improvement program: tree seed orchards, and progeny test sites. Tree seed orchards would be managed to produce adequate supplies of genetically-selected seed. Progeny test sites would be managed to conduct comparative testing of growth rates for selected trees as part of the genetics program.

Stand Protection

Stand protection procedures would be designed to protect newly planted seedlings from natural hazards such as animal browse or wildfires. Treatments could include shading to protect seedlings from the sun, and bud capping or placing plastic tubes or netting over seedlings for protection from animal browsing or clipping. Control measures would be implemented to reduce populations of animals such as mountain beaver where their population reaches levels high enough to threaten forest stands. These types of treatments would be determined annually in conjunction with normal reforestation surveys.

Stands would also be managed to decrease the risk of destruction from wildfire. Management practices could include stand manipulation treatments such as underburning, pruning, density management, or hand piling of slash. Retention of hardwoods in stands may result in somewhat higher levels of resistance to low intensity fires.

Plantation Maintenance and Release

Maintenance treatments promote the survival and establishment of coniferous seedlings. Release treatments reduce competition for light, moisture, and nutrients between shrubs, grass, hardwoods, and existing commercial coniferous seedlings. Maintenance and release treatments also promote dominance and growth of established coniferous trees.

Fast-growing hardwoods (e.g., red alder, bigleaf maple and vine maple in the central and northern parts of the district, and tan oak in the southern portion) overtop and suppress slow-starting conifer seedlings. The degree and type of competition varies with the individual site. On dry sites, grasses, forbs, and shrubs such as scotch broom, ocean spray, and manzanita are strong competitors for water; elsewhere shrubs such as salmonberry, thimbleberry, and ceanothus species grow rapidly enough to shut out essential light. With reduced competition, the conifers rapidly grow beyond the point of being overtopped and further suppressed by surrounding vegetation. When this growth situation is achieved (approximately 5 to 15 years after planting), no further effort would be taken to control competing vegetation.

An integrated vegetation management approach would be used in selection of maintenance and release treatments, in conformance with the ROD for the BLM's Western Oregon Program-Management of Competing Vegetation, 1992. Herbicides would be used to control competing vegetation when analysis concludes their use to be the most appropriate treatment. (See the previous section on site preparation for further discussion of herbicide use.) Manual vegetation control methods (i.e., clearing around selected commercial trees using hand and power tools) would also be used when considered most appropriate to assure commercial tree growth.

Yew trees would be reserved in any plantation where maintenance or release treatments are prescribed.

Precommercial Thinning (Density Management) and Release

Precommercial thinning and release practices are designed to control stand density and species composition. Thinning and release may occur simultaneously or separately with other stand management actions depending on considerations including stand conditions, cost, and the efficacy of methods. The practices of precommercial thinning and release can help meet the objectives for stand diversity, growth, and species composition. The principal effects of these practices on timber yield are permitting earlier harvest through development of larger tree sizes, increasing the percent of stand volume on desired species, creating stand densities and size distributions conducive to commercial thinning, and permitting genetic tree improvement and forest fertilization to increase yields without loss of additional growth to density related mortality.

Site-specific decisionmaking processes for herbicide release treatments follow the processes outlined in the ROD, for the BLM's Western Oregon Program- Management of Competing Vegetation, 1992.

In all alternatives, retention of a varying level of species diversity, including hardwoods and shrubs, would occur. Maintenance and other vegetation management actions would be planned to meet species diversity goals.

Precommercial thinning would be applied to those timber stands in the intensive timber production base that are between 8 and 18 years of age and contain over 450 stems per acre. Through this treatment available nutrients, moisture, and light are concentrated on those trees which would be the eventual crop for future harvest.

The number of trees cut per acre during precommercial thinning would depend on the stand density before thinning. While average spacing of crop trees would be approximately 13 feet, the number of crop trees left may vary between 225 and 360 per acre, depending on future management opportunities. Contract specifications, emphasized by field instructions to crews, would identify desired spacing of crop trees and criteria for crop tree and species selection. Yew trees would be reserved in precommercial thinning operations.

Precommercial thinning may also be conducted on some previously untreated stands between the ages of 19 and 30. PCT within these stands would be at a wider spacing than in younger stands.

Commercial Thinning (Density Management)

Commercial thinnings are scheduled any time after developing stands reach a combination of stem diameter and surplus volume to permit a commercial entry. Commercial thinning may effectively increase recoverable timber production (volume) and structural diversity objectives to as late as 150 years (Williamson and Price, 1971; Williamson, 1982). Heavy commercial thinning shows the ability to accelerate the development of old-growth characteristics in even-aged stands (Newton and Cole, 1987).

Forest Fertilization

Stand growth is limited by the supply of available nutrients, particularly available nitrogen. The supply of soil nutrients may be conserved through proper design of management actions, or may be augmented through either forest fertilization or through retention of species and structural diversity in stands. Forest fertilization practices are designed based on extensive research literature, including work in southwestern Oregon. Fertilization actions are usually designed to apply 200 pounds of available nitrogen with helicopters in the form of urea-based prill (46 percent available nitrogen). In some cases, fertilizer may be applied in a liquid urea-ammonia form or with an admixture of other nutrient elements in addition to nitrogen. Hand application is usually impractical.

Forest fertilization actions are usually sequenced with thinning actions and spaced 10 to 15 years apart. The effect of forest fertilization on uneven-aged stands, and on stands older than 70 years of age is unknown although some positive response is probable.

Fertilization has the effect of accelerating stand and seral development. Since fertilizer increases the rate at which tree canopies expand and increases tree vigor, fertilization it has been observed to reduce thinning shock and accelerate release from competing vegetation.

Appendix II - F

BLM's Tree Improvement Program and the Genetic Diversity of Improved Species

Tree improvement programs in Oregon and the Northwest are designed to increase the production of wood fiber. Current methodology also addresses concems for conserving and enhancing genetic diversity of improved species as the basis for future genetic adaptation (Daniels 1990). The BLM's tree improvement program has been designed with this criteria to provide opportunities for meeting unforeseen future needs.

The growth enhancement and resistance to disease estimated from genetic tree improvement is based on the ability to detect and select desired traits from the genetic variation naturally present in tree species. By management, the frequency of these selected traits is increased in proportion to the host of other traits present in the total population.

Douglas-fir exhibits high levels of genetic variability relative to other forest tree species. Studies of genetic diversity in coastal Douglas-fir have consistently shown that a great deal of variation exists in this species for genes controlling quantitative traits (Silen 1978). Considerable variability is also indicated by physiological, morphological, and other biochemical data. This variability is great both within individual stands and between stands located across a wide range of geographic and environmental conditions. This information suggests that conserving natural genetic diversity requires establishing programs to maintain variations both within and between stands.

The BLM is a member of the Northwest Tree Improvement Cooperative, which encompasses lands owned by federal, state, county, and private organizations. The cooperative has subdivided the participating land base into specific breeding units. These units have been defined by differences in geography and elevation and appear to differ genetically from unit to unit. Breeding units range in size from 30,000 to 200,000 acres, dependent on the perceived environmental variation present. There are approximately 70 breeding units comprising about six million acres of forest land. The breeding units are intended to conserve and maintain the genetic diversity within and between populations (stands) of selected tree species.

Project design used to enhance gene conservation includes selection of a large number of parent trees within each breeding unit. This number of parent trees ranges from 160 to 900 per unit depending on the size of the breeding unit. Parent trees are selected on the basis of easily measurable growth characteristics such as age, growth rate, form, and vigor. The combination of numerous breeding units and the selection of hundreds of parent trees per unit provides a broad genetic base for the breeding program and seed orchard development.

Another feature of the cooperative program that contributes to gene conservation is the establishment of progeny test plantations. Parent trees selected for breeding and seed orchard use undergo a standardized field testing of their offspring. A series of progeny tests, comprising 6 to 12 test plantations, are established within every breeding unit. Each test plantation contains several thousand well-maintained and identified test trees. Approximately 650 progeny test plantations containing nearly three million individuals have been established. At least one parent is known for each tested individual. Growth data for each individual tree is systematically collected, analyzed, and stored for both short-term and long-term use. These test sites represent a reservoir of genetic diversity from local gene pools of the selected tree species throughout the region. They are a valuable source of information and materials for forest research and the improvement of forest management.

The BLM's western Oregon tree improvement program contains 52 Douglas-fir breeding units; a seed orchard will be established for each of these. Seed orchards consist of 50 to 100 unrelated parent trees, each selected for its superior growth rate, and stable performance across the breeding unit, as demonstrated in the progeny test plantations. Studies have shown that for quantitative traits (e.g., growth rate) the number of different genotypes that can be generated through recombination is extremely large (Kang 1980). By creating a very diverse population from a relatively small number of individuals which show some genetic diversity, seed orchards will provide ample quantitative genetic variability.

Seed orchards will be used for the production of seed for reforestation utilizing parent trees selected primarily for stable performance and rapid growth rates. Such selection would reduce the frequency of certain characteristics in the total population but not completely eliminate those characteristics which presently appear less desirable. The gene pool could actually be broadened by cross breeding trees that would otherwise be unable to cross pollinate in the wild due to physical separation.

Tree breeding has not yet resulted in dangerous uniformity in forestry (Ledig 1988). Adams (1981) studied isozymes of Douglas-fir and reported plantations reforested from the first generation seed orchards are not appreciably less variable than natural populations in the same breeding units, and certainly would be as variable, if not more so, than plantations regenerated from seed of commercial collections or seed trees. Adams further concluded that tree improvement efforts may lead to a broader genetic base in populations than that occurring with present regeneration, at least in the earlier generations of breeding programs. Care must be taken in the long term to ensure that outstandingly superior lines are not overused to maximize growth (Ledig 1988).

The sugar pine tree improvement program has focused on identifying those parent trees which are resistant to the white pine blister rust. For over 30 years, the BLM has cooperated with the U.S. Forest Service to build a population of sugar pine trees in southwest Oregon that are known to resist the effects of the disease.

Hundreds of disease-resistant parents have been identified by testing thousands of apparently resistant sugar pines in 10 breeding zones. These resistant parents are used for cone collections and for establishment of seed orchards. The combination of characteristics produced in the seed orchard quickly yields a diversity of genetic disease resistance mechanisms in the sugar pine population which would be impossible to achieve under natural forest conditions.

Chapter 4, Biodiversity Section, contains a discussion of the effects of timber management on genetic diversity.

Appendix II-G

Wild and Scenic River Eligibility and Classification Determinations

The first step in proposing additional rivers to the National Wild and Scenic Rivers System (NWSRS) is to determine if the river is eligible. To qualify, a river must meet two criteria: (1) it must be free flowing and (2) with its immediate environment, it must have at least one outstanding remarkable value. Free-flowing, as defined in Section 16(b) of the Wild and Scenic Rivers Act, means "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." Free-flowing should not be confused with naturally flowing, which is flowing without any up-stream manipulation except by nature. The presence of impoundments above and below the segment (including those that regulate the flow regime through the segment) and existing minor dams and diversion structures within the study reach will not by themselves render a river ineligible. There are many river segments in the NWSRS that are downstream from major dams, such as the Rogue River in Oregon and the lower Klamath River in California, or are between dams, such as the Tuolumne River in California. Some components of the system, such as the Clackamas, Deschutes, and Snake Rivers in Oregon and the Trinity River in California, even derive their recreational values, at least in part, from the operation of upstream dams. These values are stated in the Wild and Scenic Rivers Act as, "scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values." Since the Rivers Act did not specifically spell out the criteria to judge these values, the BLM westside Oregon districts developed criteria (Instruction Memorandum OR-89-632) which, in part, follows:

> "A river's scenic, recreational, geologic, fish, wildlife, cultural, and/or historic value(s) are deemed 'outstandingly remarkable' if one or more of the following guidelines apply to the value(s) under consideration.
>
> Scenic - The landscape elements of landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications are unique and harmonious. The rating area must be scenic quality 'A' as defined in the Visual Resource Inventory Handbook, H-8410-1. When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment length and not common to other rivers in the geographic region.
>
> Recreational - Recreational opportunities are, or have the potential to be, unique enough to attract visitors from outside the geographic region. Visitors would be willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but not be limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting and boating.
>
> Interpretive opportunities may be exceptional and attract or have the potential to attract visitors from outside the geographic region.
>
> The river may provide or have the potential to provide settings for national or regional commercial usage or competitive events.
>
> Geologic - The river or the area within the river corridor contains an example(s) of a geologic feature, process, or phenomena that is rare, unusual, one-of-a-kind or unique to the geographic region. The feature(s) may be in an unusually active state of development, represent a 'textbook' example and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial and other geologic structures).
>
> Fish - Fish values may be judged on the relative merits of either fish populations or habitat - or a combination of these river-related conditions:
>
> Populations - The river is nationally or regionally one of the top producers of resident and/or anadromous fish species. Of particular significance is the presence of wild or unique stocks, or populations of federally-listed or candidate threatened and endangered species.
>
> Habitat - The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for federally-listed or candidate threatened and endangered species.

Wildlife - Wildlife values may be judged on the relative merits of either wildlife populations or habitat, or a combination of these conditions:

Populations -	The river or river area within the river corridor contains nationally or regionally important populations of indigenous wildlife species dependent on the river environment. Of particular significance are species considered to be unique or populations or federally-listed or candidate threatened and endangered species which are so dependent.
Habitat -	The river or area within the river corridor provides a principal food source, unique habitation site, or migration route for wildlife of national or regional significance, or for a federally-listed or candidate threatened and endangered species. Contiguous habitat conditions are such that the biological need of the species are met.

Cultural - The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by native Americans. Sites must be rare, one-of-a-kind, have unusual characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

Historic - The river or area within the river corridor contains a sites(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusually or one-of-a-kind in the region. A historic site(s) and/or feature(s) in most cases is 50 years old or older. Of particular significance are sites or features listed in, or are eligible for inclusion in, the National Register of Historic Places.

Other Similar Values - While no specific evaluation guidelines have been developed for the 'other similar values' category, it is assumed that districts will assess additional river-related values not covered in this attachment in a manner consistent with the foregoing guidance - including, but not limited to hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities."

After determining a river's eligibility for inclusion in the National Wild and Scenic River System, a river must be classified according to the category - wild, scenic, or recreational - that best fits each eligible segment. These terms can be misleading; for instance, a "scenic" river may have been designated for reasons other than scenery, and a "recreation" river doesn't necessarily have outstandingly remarkable recreational resources. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands as they exist at the time of the study.

Classifying a study river as wild, scenic, or recreational implies a level of interim management for federal lands in the study area until a decision on designations is made by Congress. If Congress designates a river or river segment, it will be managed according to its specific classification. Congress may classify a river segment at or below the highest level for which it qualifies. Specific management strategies may vary according to classification, but would be designed to protect and enhance the outstandingly remarkable values of the river area. These strategies are formulated during development of the management plan, which is required within three fiscal years of designation (Section 3(d)(1), Wild and Scenic Rivers Act).

The three classification categories for eligible rivers are defined in Section 2(b) of the 1968 National Wild and Scenic River Act as:

Wild River Areas -	Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
Scenic River Areas -	Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
Recreational River Areas -	Those rivers or sections of rivers that are readily accessible by road or railroad,

that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

The Federal Register, Vol. 47, No. 174, September 7, 1982, gives guidance for classifying rivers. Water quality, water resources development, shoreline development, and accessibility are the criteria to be considered when determining classification. While each criterion is important, their collective intent is more important. Although each classification permits existing development, the criteria do not imply that additional inconsistent development is permitted in the future. Developments that are compatible with designation would be allowed, provided they are carried out in an environmentally-sound manner. Table II-G-1 further defines the four criteria.

Table II-G-1. Classification Criteria for Wild, Scenic, and Recreational Rivers

Attribute	Wild	Scenic	Recreational
Water Resources Development	Free of impoundment.	Free of impoundment.	Some existing impoundments or diversion.
			The existence of low dams, diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity.	Largely primitive and undeveloped. No substantial evidence of human activity.	Some development. Substantial evidence of human activity.
	The presence of a few inconspicuous structures, particularly those of historic or cultural values, is acceptable.	The presence of small communities or dispersed dwellings or farm structures is acceptable.	The presence of extensive residential development and a few commercial structures is acceptable.
	A limited amount of domestic livestock grazing or hay production is acceptable.	The presence of grazing, hay production or row crops is acceptable.	Lands may have been developed for the full range of agricultural and forestry uses.
	Little or no evidence of past timber harvest. No ongoing timber harvest.	Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	May show evidence of past and ongoing timber harvest.

Table II-G-1 (Continued)

Attribute	Wild	Scenic	Recreational
Water Quality	Meets or exceeds Federal criteria or federally approved State standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria prescribed the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable Federal and State laws.	
Accessibility	Generally inaccessible except by trail. No roads, railroads, or other provisions for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existence of parallel roads or railroads on one or both banks as well as bridge crossings and other river access points is acceptable.

Source: The Federal Register, Vol. 47, No. 174, September 7, 1982.

Appendix II-H

Management Guidelines and Standards for National Wild and Scenic Rivers

The Wild and Scenic Rivers Act (Public Law 90-542 as amended) established a method for providing federal protection for certain of our remaining free-flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development which the Act provides. The following guidelines and standards are extracted in part from the February 3, 1970, and August 26, 1982, joint Department of the Interior and Department of Agriculture guidelines. They would apply to designated rivers through incorporation in formal management plans which are normally developed within three years of designation. The guidelines also apply, on an interim basis, to BLM-administered lands along BLM study rivers, as well as other rivers or river segments which have been found by the BLM to be eligible for consideration as components of the National Wild and Scenic River System (WSRS). In the latter instance, interim application of the guidelines would continue until lifted by a determination of nonsuitability through BLM's planning (RMP) process or by Congressional action.

Section 10(a) of the Act states that:

> "Each component of the National Wild and Scenic Rivers System shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration, primary emphasis shall be given to protecting its aesthetic, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

This section is interpreted by the Secretaries of the Interior and Agriculture as stating a nondegradation and enhancement policy for all designated river areas, regardless of classification.

The Congress with Presidential approval may determine which river segments will be added to the WSRS. When a river is designated, and BLM is identified as the administering federal agency, BLM will establish administrative boundaries to protect the identified outstandingly remarkable values. By law, the land inside the boundaries normally may not exceed an average of 320 acres per river mile over the designated portion of the river. BLM would delineate boundaries based on natural or man-made features (i.e., canyon rims, roads, and ridge tops) and with consideration of legally identifiable property lines.

A river management plan must also be completed by the administering federal agency within three years after designating legislation. Existing state, local, and federal laws continue in effect during the interim along with general Department of Interior guidelines. If federal designation overlaps State Scenic Waterway designation, a joint federal/state management plan would be developed. All management plans will address the roles of federal, state, county, and relevant Indian tribal governments in management of the river.

Discussion of BLM's inventory to determine which river stretches are eligible for consideration as components of the system is presented in Chapter 2 and Appendix II-G. Also included in that appendix are discussions of the criteria for eligibility for each classification (wild, scenic, recreational) for which any river reviewed has been found eligible and the results of BLM's eligibility studies.

Management objectives and standards for each river classification (i.e., recreational, scenic, and wild) are provided below.

Recreational Rivers

Recreational rivers are defined by the Act to be "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past."

Management Objective for Recreational River Areas

Management of recreational river areas should give primary emphasis to protecting the values which make it outstandingly remarkable while providing river-related outdoor recreation opportunities in a recreational setting. Recreational classification is a determination of the level of development and does not prescribe or assume recreation development or enhancement. Management of recreational river areas can and should maintain and provide outdoor recreation opportunities. The basic distinctions between a "scenic" and a "recreational" river area are the degree of access, extent of shoreline development, historical impoundment or diversion, and types of land use. In general, a variety of agricultural, water management, silvicultural, recreational, and other practices or structures are compatible with recreational river values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

Management Standards for Recreational River Areas

Recreation facilities may be established in proximity to the river, although recreational river classification does not require extensive recreational developments. Recreational facilities may still be kept to a minimum, with visitor services provided outside the river area. Future construction of impoundments, diversions, straightening, riprapping, and other modification of the waterway or adjacent lands would not be permitted except in instances where such developments would not have a direct and adverse effect on the river and its immediate environment. The following program management standards apply:

a. Forestry Practices: Forestry practices including timber harvesting would be allowed under standard restrictions to avoid adverse effects on the river environment and its associated values.

b. Hydroelectric Power and Water Resource Development: No development of hydroelectric power facilities would be permitted. Existing low dams, diversion works, rip rap and other minor structures may be maintained provided the waterway remains generally natural in appearance. New structures may be allowed provided that the area remains generally natural in appearance and the structures harmonize with the surrounding environment.

c. Mining: Subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect values of rivers included in the WSRS, new mining claims are allowed and existing operations are allowed to continue. All mineral activity on federally-administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the recreational river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

d. Road and Trail Construction: Existing parallel roads can be maintained on one or both river banks. There can be several bridge crossings and numerous river access points. Roads, trails, and visitor areas must conform to construction and maintenance standards and be free of recognized hazards.

e. Agricultural Practices and Livestock Grazing: Lands may be managed for a full range of agriculture and livestock grazing uses, consistent with current practices.

f. Recreation Facilities: Interpretive centers, administrative headquarters, campgrounds and picnic areas may be established in proximity to the river. However, recreational classification does not require extensive recreation development.

g. Public Use and Access: Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in recreational river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance recreational river values. Any new structures must meet established safety and health standards or, in their absence, be free of any recognized hazard.

h. Rights-of-Way: New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders, and laws. Where no reasonable alternative location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on recreational river area related values and fully evaluated during the site selection process.

i. Motorized Travel: Motorized travel on land will generally be permitted on existing roads. Controls will usually be similar to that of surrounding lands. Motorized travel on water will be in accordance with existing regulations or restrictions.

j. Instream Flow Assessment: To the extent practical, consistent with resource management objectives, quantify instream flow and protection requirements related to outstandingly remarkable and other resource values identified through the RMP process. Where possible, conduct a comprehensive, interdisciplinary, resource value-based assessment in order to delineate resource values, relate flows to resource conditions, and formulate flow strategies which incorporate legal, technical, and administrative aspects in order to secure instream flows which address values associated with the recreational river segment.

Scenic Rivers

Scenic rivers are defined by the Act to be: “Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.”

Management Objective for Scenic River Areas

Management of scenic river areas should maintain and provide outdoor recreation opportunities in a near-natural setting. In general, a wide range of agricultural, water management, silvicultural, and other practices or structures could be compatible with scenic river values, providing such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

Management Standards for Scenic River Areas

The same limitations set forth for recreational river areas are applicable, except that developments should harmonize with the environment, and any developments on shore lands should be screened from the river. The following program management standards apply:

a. Forestry Practices: Silvicultural practices, including timber harvesting, could be allowed provided that such practices do not cause substantial adverse effect on the river and its immediate environment. The river area should be maintained in its near-natural condition. Timber outside the boundary, but within the visual seen area, should be managed and harvested in a manner which provides special emphasis on visual quality. Preferably, reestablishment of tree cover would be through natural revegetation. Cutting of dead and down materials for fuelwood should be limited. Where necessary, restrictions on use of wood for fuel may be prescribed.

b. Hydroelectric Power and Water Resource Development: No development of hydroelectric power facilities would be permitted. Flood control dams and levees would be prohibited. All water supply dams and major diversions are prohibited. Maintenance of existing facilities and construction of some new structures would be permitted, provided the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

c. Mining: Subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the values of rivers included in the WSRS, new mining claims and mineral leases can be allowed. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the scenic river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

d. Road and Trail Construction: Roads or trails may occasionally bridge the river area, and short stretches of conspicuous roads or long stretches of inconspicuous and well-screened roads could be allowed. Maintenance of existing roads and any new roads will be based on the type of use for which the roads/ trails are constructed and the type of use that will occur in the river area.

e. Agricultural Practices and Livestock Grazing: A wide range of agricultural and livestock grazing uses is permitted to the extent currently practiced. Row crops are not considered an intrusion of the "largely primitive" nature of scenic corridors as long as there is not a substantial adverse effect on the natural-like appearance of the river area.

f. Recreation Facilities: Larger-scale public use facilities, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters are allowed if such facilities are screened from the river.

g. Public Use and Access: Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in scenic river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance scenic river values.

h. Rights-of-Way: New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders, or laws. Where no reasonable alternative location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on scenic river area related values and fully evaluated during the site selection process.

i. Motorized Travel: Motorized travel on land or water may be permitted, prohibited, or restricted to protect river values. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

j. Instream Flow Assessment: To the extent practical, consistent with resource management objectives, quantify instream flow and protection requirements related to outstandingly remarkable and other resource values identified through the RMP process. Where possible, conduct a comprehensive, interdisciplinary, resource value-based assessment in order to delineate resource values, relate flows to resource conditions, and formulate flow strategies which incorporate legal, technical, and administrative aspects in order to secure instream flows which address values associated with the scenic river segment.

Wild Rivers

Wild rivers are defined by the Act to include: "Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America."

Management Objective for Wild River Areas

Management of wild river areas should give primary emphasis to protecting the values which make it outstandingly remarkable while providing river-related outdoor recreation opportunities in a primitive setting.

Management Standards for Wild River Areas

Allowable management practices might include construction of minor structures for such purposes as: improvement of fish and game habitat; grazing; protection from fire, insects, or disease; and rehabilitation or stabilization of damaged resources, provided the area will remain natural appearing and the practices or structures will harmonize with the environment. Developments such as trail bridges, occasional fencing, natural-appearing water diversions, ditches, flow measurement or other water management devices, and similar facilities may be permitted if they are unobtrusive and do not have a significant direct and adverse effect on the natural character of the river area. The following program management standards apply:

a. Forestry Practices: Cutting of trees will not be permitted except when needed in association with a primitive recreation experience (such as clearing for trails), for visitor safety, or to protect the environment (such as control of fire). Timber outside the boundary, but within the visual corridors should, where feasible, be managed and harvested in a manner to provide special emphasis to visual quality.

b. Hydroelectric Power and Water Resource Development: No development of hydroelectric power facilities would be permitted. No new flood control dams, levees, or other works are allowed in the channel or river corridor. All water supply dams and major diversions are prohibited. The natural appearance and essentially primitive character of the river area must be maintained. Federal agency groundwater development for range, wildlife, recreation or administrative facilities may be permitted if there are no adverse affects on outstandingly remarkable river related values.

c. Mining: New mining claims and mineral leases are prohibited on federal lands constituting the river bed or bank or located within 0.25-mile from the ordinary high water mark on both sides of the river. Valid existing claims would not be abrogated and, subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the rivers included in the National System, existing mining activity would be allowed to continue. All mineral activity on federally-administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation, pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the wild river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

d. Road and Trail Construction: No construction of new roads, trails, or other provisions for overland motorized travel would be permitted within the river corridor. A few inconspicuous roads or unobtrusive trail bridges leading to the boundary of the river area may be permitted.

e. Agricultural Practices and Livestock Grazing: Agricultural use is restricted to a limited amount of domestic livestock grazing and hay production to the extent practiced prior to designation. Row crops are prohibited.

f. Recreation Facilities: Major public-use areas, such as campgrounds, interpretive centers, or administrative headquarters are located outside wild river areas. Simple comfort and convenience facilities such as toilets, tables, fireplaces, shelters and refuse containers may be provided as necessary within the river area. These should harmonize with the surroundings. Unobtrusive hiking and horseback riding trail bridges could be allowed on tributaries, but would not normally cross the designated river.

g. Public Use and Access: Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in wild river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance wild river values.

h. Rights-of-Way: New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on wild river area related values and fully evaluated during the site selection process.

i. Motorized Travel: Motorized travel on land or water could be permitted, but it is generally not compatible with this river classification. Normally, motorized use will be prohibited in a wild river area. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

j. Instream Flow Assessment: To the extent practical and consistent with resource management objectives, instream flows sufficient to meet the purposes of the designated WSR should be protected and enhanced if possible. Based on the results of an instream flow assessment, implement flow protection strategies and actions that incorporate legal, technical, and administrative aspects in order to secure instream flow protection for applicable river segments. Protection strategies should be addressed and incorporated in river management plans.

Management Objectives Common to Wild, Scenic and Recreational Rivers

Fire Protection and Suppression: Management and suppression of fires within a designated river area will be carried out in a manner compatible with contiguous federal lands. On wildfires, suppression methods will be utilized that minimize long-term impacts on the river and river area. Presuppression and prevention activities will be conducted in a manner which reflects management objectives for the specific river segment. Prescribed fire may be utilized to maintain or restore ecological condition or meet objectives of the river plan.

Insects, Diseases and Noxious Weeds: The control of forest and rangeland pests, diseases, and noxious weed infestations will be carried out in a manner compatible with the intent of the Wild and Scenic River Act and management objectives of contiguous federal lands.

Cultural Resources: Historic and prehistoric resource sites will be identified, evaluated, and protected in a manner compatible with the management objectives of the river and in accordance with applicable regulations and policies. Where appropriate, historic or prehistoric sites will be stabilized, enhanced and interpreted.

Water Quality: Water quality will be maintained or improved to meet federal criteria or federally-approved state standards. River management plans shall prescribe a process for monitoring water quality on a continuing basis.

Fish and Wildlife Habitat Improvement: The construction and maintenance of minor structures for the protection, conservation, rehabilitation or enhancement of fish and wildlife habitat are acceptable provided they do not affect the free-flowing characteristics of the river, are compatible with the river's classification, that the area remains natural in appearance, and the practices or structures harmonize with the surrounding environment.

Water Rights: In the process of evaluating river segments, authorizing officials are held to established principles of law with respect to water rights. Under provisions of Section 13 of the Wild and Scenic River Act, as well as other statutes, river studies shall not interfere (except for licenses under Section 7(b) of the Wild and Scenic Rivers Act, pertaining to Section 5(a) WSRS river studies) with existing rights, including the right of access, with respect to the beds of navigable streams, tributaries, or river segments. In addition, under the Federal Land Policy and Management Act and the Federal Power Act, the BLM has conditioning authority to control any proposed projects which would be incompatible or potentially degrading to river and/or other identified resource values.

Oregon Scenic Waterways Act

In 1969, the state of Oregon passed the Oregon Scenic Waterways Act to establish a program to protect designated rivers throughout Oregon. The program is administered by the Oregon Department of Parks and Recreation, and its goals are to protect the free-flowing character of designated rivers for fish, wildlife and recreation. Dams, reservoirs, impoundments, and placer mining are prohibited on state scenic waterways. The Act requires review of any new development proposed along designated rivers. It does not affect existing water rights, development, or uses.

Management Constraints on Private Lands

Designation of a river under the Wild and Scenic Rivers Act gives the federal government no authority to regulate or zone private lands. Land use controls on private lands are solely a matter of state and local zoning regulations. Although the W&SR Act includes provisions encouraging the protection of river values through state and governmental land use planning, these provisions are not binding on local governments. The federal govemment is responsible for assuring that designated rivers are managed in a manner which meets the intent of the W&SR Act.

River management plans may prescribe land use or development limitations to protect outstandingly remarkable river values. Many uses may be compatible with a wild, scenic or recreational classification as long as the rivers are administered to protect and enhance the values which caused them to be included in the national system. Most existing uses and activities on adjoining private lands may continue. Timber harvest activities on private lands within a W&SR boundary would continue to be regulated by the Oregon Forest Practices Act.

The primary consideration in any river or land use limitation would be the protection and enhancement of a designated river's outstandingly remarkable values. BLM will work closely with landowners to assure that all uses will be consistent with the intent of the W&SR Act. Those uses that clearly threaten identified outstandingly remarkable values would be addressed on a case-by-case basis.

Specific management goals for new building, and other structural or road construction, on private lands along designated rivers would be addressed through the individual river management plans. Federal guidelines allow different degrees of development along rivers classified as wild, scenic or recreational. In consultation with landowners involved, every effort would be made to reduce adverse impacts to an acceptable level on proposals for major up-grading, realignment and/or new construction of roads. Maintenance of existing roads would generally not alter a river's condition and thus would not be restricted.

On designated rivers, BLM could negotiate with a landowner to purchase specific development rights necessary to prevent any threat to the river's identified outstandingly remarkable values if all other efforts fail to reduce anticipated adverse impacts to an acceptable level. Another option, where mutually agreeable, would be a land exchange providing the private landowner with comparable lands outside the administrative boundary of a river.

The W&SR Act specifically prohibits the use of condemnation in the fee title purchase of lands if 50 percent or more of the land within the boundary is already in public ownership. While the Act provides the federal government with authority to purchase scenic, conservation or access easements through condemnation proceedings, this is considered to be a measure of last resort. In the event condemnation was considered necessary, the only landowner rights purchased would be those considered necessary to prevent the threat to the river.

If BLM acquires an easement on private land, depending upon its terms and conditions, public access rights may or may not be involved. For example, a scenic easement could only involve the protection of narrowly-defined visual qualities with no provisions for public use. Any trail or road easement would involve public use provisions. Any provisions for public use of private lands must be specifically purchased from the landowner. BLM would work closely with landowners to minimize public use of non-federal lands through brochures, maps, signs and/or other appropriate means, except in locations where rights to such use are acquired.

W&SR designation does not affect a private landowner's rights to control trespass. Landowners can charge a fee for crossing private lands to fish designated rivers except where a public access easement exists. The designation of a river into the National WSRS does not change landowner rights unless all or a portion of these rights are acquired from the landowner.

The designation of a river into the WSRS has no bearing upon the determination of navigability. On navigable rivers, the river bed and banks to the mean high water mark are state lands and are available under state laws for public use. Private landowners control public access to their property along the banks of non-navigable rivers.

Ownership and use of valid water rights are not affected by a W&SR designation.

Appendix II-I

Land Ownership Adjustment Criteria

In accordance with FLPMA and other laws, Executive Orders, and Departmental and Bureau policy, the evaluation process for any land disposal or acquisition will provide for consideration of unique resource values or other factors, including but not limited to those listed below:

- Access to public lands or access for public purposes.
- Threatened, Endangered, or sensitive plant and animal species habitat.
- Riparian areas, flood plains, and wetlands.
- Fish habitat.
- Nesting/breeding habitat for important game and non-game animals.
- Seasonal habitat of big game.
- Developed recreation sites and recreation use areas.
- Unique sites or habitats with fish, wildlife, botanical, cultural, or recreational interpretive values.
- High quality scenery.
- Energy and mineral potential.
- Land adjacent to rivers suitable for designation under the National Wild and Scenic Rivers Act.
- Significant cultural resources and sites eligible for inclusion on the National Register of Historic Places.
- Designated wilderness areas and areas being studied for possible wilderness designation.
- Accessibility of the land for recreation and other public uses.
- Amount of public investments in facilities or improvements and the potential for recovering those investments.
- Difficulty or cost of administration (manageability).
- To develop a more manageable land base for timber management (e.g., provide for logical harvest units, balance age class distributions).
- Significance of the decision in stabilizing business, social and economic conditions, and/or lifestyles.
- Whether private sites exist for the proposed use.
- Encumbrances, including but not limited to withdrawals and existing leases or permits.
- Consistency with cooperative agreements, and plans or policies of other agencies.
- Suitability (need for change in land ownership or use) for purposes including but not limited to community expansion or economic development, such as industrial, residential, or agricultural (other than grazing) development.

Appendix II-J

Zone III - Lands

The following is a list of BLM-administered lands in the planning area identified through the planning process as being available for use in exchanges for private inholdings in Zones 1 or 2. These lands also may be available for disposal through sale under FLPMA Section 203(a) if no important recreation, wildlife, watershed, special status species habitat, and/or cultural values are identified during disposal clearance reviews, and no viable exchange proposals can be identified.

Township	Range	Section	Subdivision	Status	Acres
19S	12W	1	Lots 1, 2	PD	40.48
21S	11W	31	Lot 11	PD	40.00
		32	Lots 16, 23	PD	59.01
22S	8W	15	Lot 9, 10	O&C	25.30
		21	Lots 7, 14	O&C	2.42
25S	11W	30	Lot 5	PD	39.92
25S	13W	06	Por. Lot 4		
		07	Pors. of NE1/4, SE1/4NW1/4, SW1/4SW1/4, E1/2SW1/4, Lots 2, 3, 4 utilized as an effluent lagoon.	PD	374.00
		07	Lots 5, 6, 7, 8	PD	109.73
26S	08W	10	SE1/4NE1/4	PD	40.00
26S	11W	08	NW1/4NE1/4	PD	40.00
26S	14W	28	NW1/4NE1/4	PD	40.00
27S	11W	05	Por. S1/2NE1/4SE1/4NW1/4, SE1/4NW1/4SE1/4NW1/4	CBWR	1.32
27S	12W	13	Por. SE1/4NW1/4SE1/4	CBWR	.86
27S	14W	29	Lot 3	PD	2.28
28S	12W	19	SE1/4SE1/4	CBWR	40.00
30S	13W	21	N1/2NE1/4NW1/4	PD	20.00
32S	15W	04	NE1/4SE1/4NE1/4, S1/2NE1/4NE1/4, W1/2SE1/4NE1/4, Lots 1, 2, 3, 4	PD	71.75
35S	14W	18	Lot 1	PD	2.30
39S	12W	08	W1/2NW1/4	PD	80.00

Appendix II-K

Proposed Restrictions on Mineral and Energy Exploration and Development Activity

Introduction

This appendix discusses the leasing stipulations as they would be applied to BLM managed lands in the planning area under each alternative. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on federal lands must also comply with laws and regulations administered by several agencies of the State of Oregon, however these requirements are not discussed in this document.

Leasable Mineral Resources

Oil and Gas Leasing

The Mineral Leasing Act of 1920 (as amended) provides that all publicly-owned oil and gas resources be open to leasing unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed, taking into consideration development potential and surface resources. Constraints on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. Specific proposed notices and stipulations are listed by alternative later in this Appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease, in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). Restrictions on oil and gas activities in the planning area will take the form of timing limitations, controlled surface use, or "no surface" occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

Stipulations will be attached to each lease, before it is offered for sale, by the field office which reviews the lease tract. The review will be conducted by consulting the direction given in this resource management plan. In addition, all lands administered by BLM within the planning area will be subject to the lease notices as shown on the following pages. Every attempt will be made to place stipulations in the lease and to minimize use of Standard Conditions of Approval attached to the site specific permit. All federal lessees or operators are required to follow procedures set forth by: Onshore Oil and Gas Orders, NTL's, The Federal Oil and Gas Royalty Management Act (as amended), The Federal Onshore Oil and Gas Leasing Reform Act and Title 43 Code of Federal Regulations, Part 3100.

Oil and Gas Operations

Geophysical Explorations

Geophysical operations may be conducted regardless of whether the land is leased or not. Notices to conduct geophysical operations on BLM surface are received by the Resource Area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a “Notice of Intent to Conduct Oil and Gas Exploration Operations” for all geophysical activities on public land administered by BLM. The notice should adequately show the location and access routes, anticipated surface damages, and timeframe. The operator is required to comply with written instructions and orders given by the Authorized Officer, and must be bonded. Signing of the Notice of Intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the Authorized Officer. A prework conference and/or site inspection may be required. Periodic checks during and upon completion of the operations will be conducted to ensure compliance with the terms of Notice of Intent, including reclamation.

Drilling Permit Process

The federal Lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by the authorized officer after considering topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple use of lands, and protection of the surface and subsurface environments. Close coordination with the State would take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving federal lands may be granted after joint State and BLM review.

Notice of Staking

Once the company makes the decision to drill, they must decide whether to submit a Notice of Staking (NOS) or apply directly for a permit to drill. The NOS is an outline of what the company intends to do, including a location map and sketched site plan. The NOS is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-way and special use permits. The BLM utilizes information contained in the NOS and obtained from the on-site inspection to develop stipulations to be incorporated into the application for permit to drill. Upon receipt of the NOS, the BLM posts the document and pertinent information about the proposed well in the District Office for a minimum of 30 days prior to approval, for review and comment by the public.

Application for Permit to Drill (APD)

The operator may or may not choose to submit a NOS; in either case, an Application for Permit to Drill (APD) must be submitted prior to drilling. An APD consists of two main parts; a 12 point surface plan which describes any surface disturbances and is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal, and an eight point subsurface plan which details the drilling program and is reviewed by the staff mineral specialist or geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the APD option, the on-site inspection is used to assess possible impact and develop stipulations to minimize these impacts. If the NOS option is not utilized, the 30 day posting period begins with the filing of the APD. Private surface owner input is actively solicited during the APD stage.

Geothermal Leasing

The Geothermal Steam Act of 1970 (as amended) provides for the issuance of leases for the development and utilization of geothermal steam and associated geothermal resources. Geothermal leasing and operational regulations are contained in Title 43 Code of Federal Regulations, Part 3200. Through the land use planning process the availability of the geothermal resources for leasing is analyzed, taking into consideration development potential and surface and subsurface resources. Constraints on geothermal operations are identified and placed in the leases as stipulations. Geothermal leases are then issued by the BLM Oregon State Office in Portland.

Geothermal resources within a known geothermal resource area (KGRA) are offered by competitive sale. Outside of KGRAs, leases can be issued non-competitively (over-the-counter). Prior to a competitive lease sale, or the issuance of a non-competitive lease, each tract will be reviewed, and appropriate lease stipulations will be included. The review will be conducted by consulting the direction given in this resource management plan. The issuance of a lease conveys to the lessee authorization to actively explore and/or develop the lease in accordance with regulations and lease terms and attached stipulations. Subsequent lease operations must be conducted in accordance with the regulations, Geothermal Resources Operational Orders, and any Conditions of Approval developed as a result of site-specific NEPA analysis. In the planning area, restrictions in some areas will include timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

In addition to restrictions related to the protection of surface resources, the various stipulations and conditions could contain requirements related to protection of subsurface resources. These may involve drainage protection of geothermal zones, protection of aquifers from contamination, or assumption of responsibility for any unplugged wells on the lease.

Development of geothermal resources can be done only on approved leases. Orderly development of a geothermal resource, from exploration to production, involves several major phases that must be approved separately. Each phase must undergo the appropriate level of NEPA compliance before it is approved and subsequent authorization(s) is (are) issued.

Leasing Stipulation Summary

On the following pages, the mineral leasing notices and stipulations are shown by planning alternative. The tracts of land to which these apply will, in many cases, differ by alternative. Those notices and stipulations shown as common for all alternatives are considered to be the minimum necessary in order to issue leases in the operating area. Under all alternatives, the standard leasing stipulations (Form 3100-11) alone would be utilized on most lands. The powersite stipulation (Form 3730-1) would be used on all lands included within powersite withdrawals, and the stipulation found on Form 3109-2 would be utilized for all lands under the jurisdiction of the Department of the Army, Corps of Engineers. Lease notices to protect threatened and endangered plant and animal species, and cultural resources would apply to all lands administered by BLM in the planning area. A controlled surface use special stipulation would be utilized to protect fragile soils on slopes exceeding 60 percent, and control visual impacts on VRM Class II areas. No surface occupancy special stipulations would be utilized on the following areas: lands included within R&PP and FLPMA leases; developed recreation sites; regional forest nutritional research study installations; various land use authorizations and special areas (ACECs, RNAs, and EEAs); progeny plantation sites, recreation sites; New River; Dean Creek Elk Viewing areas; The North Spit; lands classified as VRM Class I; bald eagle nest sites and nesting habitat; marbled murrelet nest sites; snowy plover nest sites and Aleutian goose use areas and critical habitat of other threatened or endangered species found on the district.

Under the No Action Alternative, the following notices and special leasing stipulations would also be utilized in addition to those described for all alternatives. A lease notice would be used to protect special status plant species on all BLM administered lands in the planning area. No surface occupancy stipulations would be utilized to protect great blue heron rookeries and osprey nest sites.

Leasing notices and stipulations for Alternative A would be the same as those described as common to all alternatives, with the following exceptions: A lease notice will not be required for special status plants; the no surface occupancy stipulation does not apply to the great blue heron or osprey nest sites.

In addition to the stipulations described as common to Alternative A, Alternative B provides a notice for special status plant species on public domain lands, and the controlled surface use stipulation to protect seral stage diversity blocks.

Under Alternative C, the following constraints would be added to those described for all alternatives: no surface occupancy stipulations would be utilized to protect great blue heron rookeries and osprey nest sites; timing stipulations to protect raptor nests; and controlled surface use stipulations to protect riparian management areas, special recreation management areas, and old growth restoration and retention blocks.

Under Alternative D, the following constraints would be added to those described for all alternatives: no surface occupancy stipulations would be utilized to protect great blue heron rookeries and osprey nest sites; timing stipulations to protect raptor nests; and controlled surface use stipulations to protect riparian management areas, special recreation management areas, and designated conservation areas for the northern spotted owl.

Under Alternative E, the following constraints would be added to those described for all alternatives: no surface occupancy stipulations would be utilized to protect great blue heron rookeries and osprey nest sites; timing stipulations to protect raptor nests and crucial winter range; and controlled surface use stipulations to protect riparian management areas, special recreation management areas, and forest stands older than 150 years.

Under the Preferred Alternative, the following notices and special leasing stipulations would be applied to the BLM-administered lands within the planning area in addition to those described as common to all alternatives: no surface occupancy stipulations would be utilized to protect great blue heron rookeries and osprey nest sites; timing stipulations to protect raptor nests; and controlled surface use stipulations to protect riparian management areas, special recreation management areas, and old-growth emphasis areas.

Leasing Stipulations by Alternative

	NA	A	B	C	D	E	PA
Standard Stipulations	x	x	x	x	x	x	x
Powersite Stipulation	x	x	x	x	x	x	x
Corps. of Engineers Stipulation	x	x	x	x	x	x	x
Notice - N. spotted owl	x	x	x	x	x	x	x
Notice - A. peregrine falcon	x	x	x	x	x	x	x
Notice - T & E animals	x	x	x	x	x	x	x
Notice - T & E plants	x	x	x	x	x	x	x
Notice - Cultural resources	x	x	x	x	x	x	x
Notice - Special Status Plant (on all BLM land)	x			x	x	x	x
Notice - Special Status Plant (PD land only)			x				
No Surface Occupancy (NSO) - Land Use Authorizations	x	x	x	x	x	x	x
NSO - Recreation Areas and Sites	x	x	x	x	x	x	x
NSO - Regional Forest Nutritional Study Installations	x	x	x	x	x	x	x
NSO - Special Areas (ACEC, RNA, EEA)	x	x	x	x	x	x	x
NSO - Progeny Plantation Sites	x	x	x	x	x	x	x
NSO - VRM Class 1	x	x	x	x	x	x	x
NSO - Bald Eagle Nest Sites	x	x	x	x	x	x	x
NSO - Marbled Murrelet Nest Sites	x	x	x	x	x	x	x
NSO - Snowy Plover Critical Habitat	x	x	x	x	x	x	x
NSO - Aleutian Goose Critical Habitat	x	x	x	x	x	x	x
NSO - Great Blue Heron	x			x	x	x	x
NSO - Osprey Nest Sites	x			x	x	x	x
Timing - Raptor Nests				x	x	x	x
Controlled Surface Use (CSU) - Seral Stage Diversity Blocks			x				
CSU - Riparian Management Areas				x	x	x	x
CSU - Soils	x	x	x	x	x	x	x
CSU - VRM Class 2	x	x	x	x	x	x	x
CSU - Special Recreation Management Area				x	x	x	x
CSU - Old Growth Restoration and Retention Blocks				x			
CSU - Designated Conservation Areas for the Northern Spotted Owl					x		
CSU - Old Forest Stands older than 150 years						x	
CSU - Old-growth Emphasis Areas							x

Each stipulation also includes waivers, exceptions, and modifications, defined as follows:

Waiver - The lifting of a stipulation from a lease which constitutes a permanent revocation of the stipulation from that time forward. This is usually a substantial change and requires a 30 day posting of the action for public involvement before the permitting activity associated with the process can be approved.

Exception - This is a one time lifting of the stipulation to allow a permitting activity for a specific proposal. It has no permanent effect on the lease stipulation and would not constitute a substantial change to the stipulation and requires no posting.

Modification - This is a change to a stipulation which either temporarily suspends the stipulation requirement or permanently lifts the application of the stipulation on a given portion of the lease. It may or may not require posting based on whether or not the change is determined to be substantial by the Authorized Officer.

Leasing Notices and Stipulations Common Under All Alternatives

1. Standard Leasing Stipulations:

a.) Standard stipulations for oil and gas are listed in Section 6 of "Offer to Lease and Lease for Oil and Gas" Form 3100-11. They are:

Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air and water, to cultural, biological, visual and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact BLM to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete inventories or short-term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects until appropriate steps have been taken to protect the site or recover the resources as determined by BLM in consultation with other appropriate agencies.

b.) Standard stipulations for geothermal leasing can be found on Offer to Lease and Lease for Geothermal Resources (Form 3200-24), Section 6, and are very similar to those described above for oil and gas leasing.

2. Powersite Stipulation (Form No. 3730-1) is to be utilized on all lands within powersite reservations.

3. Stipulation for Lands Under Jurisdiction of Department of the Army, Corps of Engineers (Form No. 3109-2).

All areas within 2,000 feet of any major structure, including but not limited to dams, spillways, or embankments, are restricted areas. The lessee, his operators, agents, or employees shall not disturb the surface or subsurface estates of the restricted areas. If the Commander or the authorized representative discovers an imminent danger to safety or security which allows no time to consult the BLM, that person may order such activities stopped immediately. The authorized officer of the BLM shall review the order and determine the need for further remedial action. Platform drilling over water areas (flood pool/drawdown zone) is prohibited; the method of drilling shall be directional from an off site base. This restriction is required because occupancy would negatively affect or interfere with authorized project purposes and/or operational needs as listed below:

Fish and Wildlife Habitat - Power Production
Flood Control - Recreation
Irrigation - Water Quality
Navigation - Water Supply
Other Legislative Authorities

Land surface occupancy may be permitted within the lease area; however, directional drilling from an off site base may be required. The Secretary of the Army or designee reserves the right to require cessation of operations if a national emergency arises. Upon request of approval from higher authority, the Commander will give the lessee written notice, or if time permits, request the BLM to give notice of the required cessation.

4. Lease Notices

The following Notices are to be issued with each lease for **all** lands administered by BLM within the planning area. Lease notices are attached to leases in the same manner as stipulations; however, there is an important distinction between lease notices and stipulations. Lease notices do not involve new restrictions or requirements. Any requirements contained in a lease notice must be fully supported in either laws, regulations, policy, or onshore oil and gas orders.

Notice

Wildlife - Northern Spotted Owl Nest Sites and Nesting Habitat

The leased lands are in an area suitable for the habitat of the Northern Spotted Owl, (*Strix occidentalis caurina*), an animal species which is officially listed as a Threatened species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species, and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

Notice

Wildlife - American Peregrine Falcon and Nesting Habitat

The leased lands are in an area suitable for the habitat of the American Peregrine Falcon (*Falco peregrinus anatum*), an animal species which is officially listed as an Endangered species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species, and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

Notice

Wildlife - Western Snowy Plover Habitat

The leased lands are in an area suitable for the habitat of the snowy plover, (*Charadrius alexandrinus nivous*), an animal species which is proposed for listing as a Threatened species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then conferencing will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The conference will determine whether or not the proposed activity would jeopardize the continued existence of the species, and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

Notice

Wildlife - Aleutian Canada Goose Habitat

The leased lands are in an area suitable for the habitat of (Aleutian Canada Goose), (*Branta canadensis leucoparia*) an animal species which is officially listed as a Threatened species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the officially listed species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species, and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973

Notice

Cultural Resources: An inventory of the leased lands would be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

1. Contact the Surface Management Agency (SMA) to determine if a cultural resource inventory is required. If an inventory is required, then;

2. The lessee or operator, will complete the required inventory; or at their option, may engage the services of a cultural resource consultant acceptable to the SMA to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten-acre minimum to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the SMA for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.

3. Implement mitigation measures required by the SMA. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as data recovery and extensive recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the SMA, surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the SMA any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the SMA.

Authorities: Compliance with Section 106 of the National Historic Preservation Act is required for all actions which may affect cultural properties eligible to the National Register of Historic Places. Section 6 of the Oil and Gas Lease Terms (Form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

5. Leasing Stipulations

The following special stipulations are to be utilized on specifically designated tracts of land as described under the various alternatives. The site specific lands may change by alternative, but the stipulation will be the same. These special stipulations will be applied to all alternatives:

Additional leasing notice and stipulations for Alternatives NA, Public Domain Lands in Alternative B, and all lands in Alternatives C, D, E, and the PA.

Notice

Special Status Plant Species: The leased lands are in an area suitable for the habitat of the plant species listed below which are considered as Federal Candidate species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may affect the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to ensure that actions will not increase the need to list the species as threatened or endangered species.

Authority: The Endangered Species Act of 1973.

Documented Priority Plant Species
Coos Bay District

Scientific Name	Common Name	Status
Bensoniella oregona	Bensonia	FC
Cordylanthus maritimus ssp. *palustris*	saltmarsh bird's beak	FC
Gentiana setigera	Waldo gentian	FC
Lasthenia macrantha ssp. *prisca*	large-flowered goldfields	FC
Oenothera wolfii	Wolf's evening primrose	FC
Phacelia argentea	silvery phacelia	FC

KEY
FC = Federal Candidate

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include slopes over 60 percent.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include slopes over 60 percent.

No Surface Occupancy

Resource: Land Use Authorizations

Stipulation: Surface occupancy and use is prohibited on Recreation and Public Purposes (R&PP) and FLPMA leases.

Objective: To protect uses on existing R&PP and FLPMA leases.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if the land use authorization boundaries are modified.

Waiver: This stipulation may be waived by the Authorized Officer if all land use authorizations within the leasehold have been terminated, canceled, or relinquished.

No Surface Occupancy

Resource: Recreation

Stipulation: Surface occupancy and use is prohibited within developed recreation areas.

Objective: To protect developed recreation areas.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer if the recreation area boundaries are changed.

Waiver: This stipulation may be waived if the Authorized Officer determines that the entire leasehold no longer contains developed recreation areas.

No Surface Occupancy

Resource: Special Areas

Stipulation: Surface occupancy and use is prohibited within Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), and Environmental Education Areas (EEAs).

Objective: To protect important historic, cultural, scenic values, natural resources, natural systems or processes, threatened and endangered plant and animal species, and/or natural hazard areas of the ACEC, RNA or EEA.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer if the ACEC, RNA or EEA boundaries are changed.

Waiver: This stipulation may be waived if the Authorized Officer determines that the entire leasehold no longer contains designated ACECs, RNAs or EEAs.

No Surface Occupancy

Resource: Regional Forest Nutritional Research Study Installations

Stipulation: Surface occupancy and use is prohibited within regional forest nutritional research study installations.

Objective: To protect regional forest nutritional research study installations.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer if the regional forest nutritional research study installation boundaries are changed.

Waiver: This stipulation may be waived if the Authorized Officer determines that the entire leasehold no longer contains regional forest nutritional research study installations.

No Surface Occupancy

Resource: Progeny plantation sites.

Stipulation: Surface occupancy and use is prohibited within progeny plantation sites.

Objective: To protect progeny plantation sites.

Exception: None.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer if the progeny plantation site boundaries are changed.

Waiver: This stipulation may be waived if the Authorized Officer determines that the entire leasehold no longer contains progeny plantation sites.

No Surface Occupancy

Resource: Visual Resource Management (VRM) Class I

Stipulation: Surface occupancy and use is prohibited in VRM Class I areas.

Objective: To preserve the existing character of the landscape.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer if the boundaries of the VRM Class I area are changed.

Waiver: This stipulation may be waived by the Authorized Officer if all VRM Class I areas within the leasehold are reduced to a lower VRM class. Areas reduced to a lower VRM class will be subject to the Controlled Surface Use stipulation for visual resources.

No Surface Occupancy

Resource: Wildlife - Bald Eagle, Osprey, Great Blue Heron, Snowy Plover, Marbled Murrelet and Aleutian Canada Goose Nest Sites and Nesting Habitat and Important Feeding and Concentration Habitat.

Stipulation: Surface occupancy and use is prohibited within 0.5 mile of known bald eagle, marbled murrelet and osprey nest sites which have been active within the past seven years and within bald eagle and osprey nesting habitat in riparian areas and within the designated boundaries of the snowy plover, great blue heron and Aleutian Canada goose habitat.

Objective: To protect nesting sites and/or nesting habitat and critical habitat in accordance with the Endangered Species Act (ESA).

Exception: An exception may be granted by the Authorized Officer if the operator submits a plan which demonstrates that the proposed action will not affect the bald eagle or its habitat. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM in consultation or conferencing with the U.S. Fish and Wildlife Service (USFWS).

Modification: The boundaries of the stipulated area may be modified if the Authorized Officer, in consultation with USFWS, determines that portion of the area can be occupied without adversely affecting nest sites or nesting and critical habitat.

Waiver: This stipulation may be waived if the Authorized Officer, in consultation with USFWS, determines that the entire leasehold can be occupied without adversely affecting nest sites or nesting habitat and other critical habitat, or if the species is declared recovered and is no longer protected under the ESA.

Controlled Surface Use

Resource: Soils

Stipulation: Prior to disturbance of slopes over 60 percent, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.
- Water quality and quantity will be in conformance with state and federal water quality laws.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Construction will not be allowed when soils are frozen.
- Additional state requirements would be incorporated into the engineering/reclamation plan.

Objective: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, or having excessive reclamation problems.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that the impacts from the proposed action are acceptable or can be adequately mitigated.

Controlled Surface Use

Resource: Visual Resource Management (VRM) Class II.

Stipulation: All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II areas may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: To control the visual impacts of activities and facilities within acceptable levels.

Exception: None.

Modification: None.

Waiver: This stipulation may be waived if the Authorized Officer determines that there are no VRM Class II areas in the leasehold.

Additional Leasing Notice and Stipulations Under No Action Alternatives (NA), C, D, E, and the Preferred Alternative (PA)

No Surface Occupancy

Resource: Wildlife - Great Blue Heron Rookery and Osprey Nests and Nest Habitat.

Stipulation: Surface occupancy and use is prohibited within 250 yards of known great blue heron rookeries and within 0.5 mile of osprey nest sites which have been active within the past seven years.
Objective: To protect great blue heron rookeries and osprey nest sites.

Exception: An exception may be granted by the Authorized Officer if the operator submits a plan which demonstrates that the proposed action will not affect the above species or its habitat. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

Modification: The boundaries of the stipulated area may be modified if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the above species or its habitat.

Waiver: This stipulation may be waived if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting great blue heron or osprey nest sites.

No Surface Occupancy

Leasing Notices and Stipulations for Alternative A are as Listed for those Common to all Alternatives.

Additional Leasing Notice and Stipulation for Alternative B

Controlled Surface Use

Resource: Seral Stage Diversity Blocks

Stipulation: Unless otherwise authorized, drill site construction and access through seral stage diversity blocks within this leasehold will be limited to established roadways.

Objective: To protect vegetation to retain and/or restore older forests for seral stage diversity.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if it is determined that portions of the area do not include seral stage diversity blocks.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include seral stage diversity blocks.

Additional Leasing Notice and Stipulations for Alternatives NA, C, D, E, and the PA

Controlled Surface Use

Resource: Riparian Management Areas.

Stipulation: Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

Objective: To protect riparian vegetation and reduce erosion adjacent to water courses.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include riparian management areas.

Controlled Surface Use

Resource: Special Recreation Management Area (SRMA).

Stipulation: Unless otherwise authorized, drill site construction and access through special recreation management areas within this leasehold will be limited to established roadways.

Objective: To protect recreational qualities of the lands involved and recreational facilities, as well as enhance recreational opportunities within the designated boundary of the SRMA.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized officer if it is determined that portions of the area do not include Special Recreation Management Areas.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include Special Recreational Management Areas.

Timing Limitation

Resource: Wildlife - Raptor Nests

Stipulation: Surface use is prohibited from March 1 to August 1, within 0.5 mile of raptor nest sites which have been active within the past two years. This stipulation does not apply to the operation and maintenance of production facilities.

Objective: To protect nest sites of raptors which have been identified as species of special concern in Oregon.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area no longer are within 0.5 mile of raptor nests which have been active within the past two years. The dates for the timing restriction may be modified if new information indicates that the March 1 to August 1 dates are not valid for the leasehold.

Waiver: This stipulation may be waived if the authorized officer determines that the entire leasehold no longer is within 0.5 mile of raptor nest sites which have been active within the past two years.

Additional Leasing Stipulation for Alternative C

Controlled Surface Use

Resource: Old Growth Restoration and Retention Blocks

Stipulation: Unless otherwise authorized, drill site construction and access through old growth restoration and retention blocks within this leasehold will be limited to established roadways.

Objective: To protect vegetation, to retain and/or restore old growth forest.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if it is determined that portions of the area do not include old growth restoration and retention blocks.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include old growth restoration and retention blocks.

Additional Leasing Stipulation for Alternative D

Controlled Surface Use

Resource: Designated Conservation Areas for the Northern Spotted Owl.

Stipulation: Unless otherwise authorized, drill site construction and access through designated conservation areas (DCAs) within this leasehold will be limited to established roadways.

Objective: To protect habitat of the Northern Spotted Owl.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if it is determined that portions of the area do not include designated conservation areas.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include designated conservation areas.

Additional Leasing Stipulation for Alternative E

Controlled Surface Use

Resource: Old Forest stands older than 150 years.

Stipulation: Unless otherwise authorized, drill site construction and access through old forest stands older than 150 years within this leasehold will be limited to established roadways.

Objective: To protect older forest stands.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if it is determined that potions of the area do no include old forest stands.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include old forest stands.

Additional Leasing Stipulations for the Preferred Alternative

Controlled Surface Use

Resource: Older Forest Stands

Stipulation: Unless otherwise authorized, drill site construction and access through Old-Growth Emphasis Areas within this leasehold will be limited to established roadways.

Objective: To protect vegetation, to retain and/or restore old-growth forest.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer if it is determined that portions of the area do not include Old-Growth Emphasis Areas.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include Old-Growth Emphasis Areas.

Appendix II-K-1

Locatable Minerals Surface Management

43 CFR 3809 Standards for Exploration,
Mining, and Reclamation on
The Coos Bay District

The following operational guidelines for mining activities have been compiled to assist the miner in complying with the 43 CFR 3809 regulations, which apply to all mining operations on BLM-administered lands in the Coos Bay District. The manner in which the necessary work is to be done will be site-specific based on an interdisciplinary team review of the project proposal, and all of the following standards may not apply to each mining operation. The operator would be required, within the plan of operations, to protect water quality with best management practices, and DEQ permit requirements. It is the mining claimant's and operator's responsibility to avoid "unnecessary or undue degradation" and they must perform all necessary reclamation work. Refer to 43 CFR 3809 regulations for general requirements. The BLM will provide site specific guidelines for some mining proposals as guided by the plan of operations.

Construction and Mining

Vegetation Removal

Remove only that vegetation which is in the way of mining activities. Merchantable timber must be marked by BLM prior to cutting, and may not be used for firewood. The BLM office will determine merchantability standards and the method used for disposal of unmerchantable material. Trees over 12 inches DBH are to be bucked and stacked in an accessible location unless they are needed for the mining operation.

Firewood

Firewood permits may be issued to the operator from designated firewood areas.

Topsoil

All excavations should have all productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled and protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds if the waste material will be left in place during reclamation.

Roads

Existing roads and trails should be used where possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed to minimize impacts on slope stability.

Water Quality

When mining will be in or near bodies of water, or sediment will be discharged, contact the Department of Environmental Quality. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the DEQ or other state agencies. Copies of such permits shall be provided to the BLM geologist if a Notice or Plan of Operations is filed.

Claim Monuments

Due to a new state law, plastic pipe is no longer allowed for claim staking in Oregon. It is BLM policy that mining claims with existing plastic pipe monuments should have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands; old markers replaced during normal claim maintenance are to be either wood posts or stone or earth mounds, consistent with state law.

Drill Sites

Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible to conduct drilling operations.

Dust and Erosion Control

While in operation, and during periods of temporary shut-down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

Fire Safety

All State fire regulations must be followed, including obtaining a campfire permit, a permit to operate power driven equipment, or blasting permit if needed. All internal combustion engines must be equipped with approved spark arresters.

Safety and Public Exclusion

The general public may not be excluded from the mining claim. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines, open pits or heavy equipment) by erecting fences, gates and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with BLM approval.

Sewage

Self-contained or chemical toilets are to be used at active mining operations and their contents disposed of at approved dump stations. Outhouses and uncontained pit toilets are not allowed.

Occupancy

Occupancy or camping on public land, in excess of 14 consecutive days, must be reasonably incident to and **required** for actual continuous mining or diligent exploration operations and will require either a Notice or Plan of Operations.

Only those persons actively involved in the mining operation or exploration work will be allowed to stay on the claim beyond the 14 day camping limit. Active operations are defined as a 40 hour work week (between 9 a.m. and 5 p.m., Monday through Friday). If operations can not be actively pursued due to high fire danger in forested areas, then occupancy of the mine site will not be permitted.

Due to high water levels in streams and creeks during the fall and winter months, placer mining with hand tools and suction dredges historically has been too sporadic to warrant full time occupancy at mine sites. Therefore, mining claim occupancy for such operations is only permitted between May 15 to November 15. Other out of stream mining ventures may warrant occupancy beyond November 15, and will be evaluated on a case by case basis.

Structures

Structures will not be allowed for exploratory operations or for suction dredge mining operations. For other types of commercial operations, the need for structures will be evaluated on a case by case basis, and if they are found necessary for the mining operation, they should be temporary in nature.

Pets

If the operator proposes to have dogs or other pets at the site, all animals must be leashed. Under no circumstances are pets to be allowed to run free at mining sites or associated camp sites.

Suction Dredging

Filing either Notice or Plan of Operations is required on all suction dredge operations. The operator must have the applicable Department of Environmental Quality suction dredge permit prior to starting work, and a copy should be submitted to the District Geologist.

Tailings Ponds

Settling ponds must be used to contain fines and any discharge into creeks must meet the Department of Environmental Quality standards.

Gates

Gates restricting public access onto a mine site will only be considered in such cases where there is a large area safety hazard created by the mining activity. Fences (rather than gates) shall be utilized to protect the public from hazards related to small excavations, tunnels, and shafts.

Trash & Garbage

Trash, garbage, used oil, etc. must be removed from public land and disposed of properly. Do not bury any trash, garbage or hazardous wastes on public lands. Accumulations of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated.

Reclamation

Reclamation of all disturbed areas must be performed as soon as possible after mining permanently ceases. Reclamation may be postponed during two years of “non-operation” (when mining in the area stops), if future mining is scheduled to resume within two years. Minimal assessment work is considered “non-operation”. Erosion must be prevented during periods of non-operation and may require road maintenance, seeding, mulching or other preventative efforts as deemed necessary by the BLM.

Equipment and Debris

All mining equipment, vehicles, structures, debris and trash must be removed from the public lands during periods of non-operation and/or at the conclusion of mining, unless authorization from BLM is given to the operator or claimant in writing.

Backfilling & Recontouring

The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Recontouring means shaping the disturbed area so that it will blend in with the surrounding lands and minimize the possibility of erosion.

Seedbed Preparation

Recontouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least six inches in rocky areas and at least 12 inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, are spread evenly over the disturbed areas.

Fertilizer

Due to the poor nutrient content of mined soils, it is important to use fertilizer to ensure maximum yield from the seeding mixture. The chemical composition of the fertilizer and rate of application would be determined by BLM. Application would be conducted to avoid introduction into streams or bodies of water.

Seeding

BLM approved seeding prescription must be used to provide adequate revegetation for erosion control, wildlife habitat, and productive secondary uses of public lands. Seeding should be done in September or October to ensure that seed is in the ground prior to the first significant winter rains. Seed utilized will be certified weed free.

Broadcast seeding is preferable on smaller sites. When using a whirlybird type seed spreader, it is important to keep the different seeds well mixed to achieve even seed distribution. For the best results, a drag harrow should be pulled over the seeded area to cover the seed before mulching. Hydromulching can be used on critical sites for rapid cover and erosion control on cut banks, fill slopes and any other disturbed areas.

Tree Replacement

Replacement of destroyed trees may be necessary with the planting of bare root or containerized seedlings.

Mulch

As directed by the BLM, during review of the Notice or Plan of Operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may need to be punched, netted, or blown on with a tackifier to hold it in place. In some cases, erosion control blankets may be cost effective for use.

Roads

After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the BLM. High wall and cutbanks are to be knocked down or backfilled to blend with the surrounding landscape. Remove all culverts from drainage crossings and cut back the fill to the original channel. The roadbed should be ripped to a minimum depth of 12 inches to reduce compaction and provide a good seedbed. The road must then be fertilized, seeded and mulched if necessary. When necessary, waterbars are to be used to block access and provide drainage.

Tailings Ponds

The ponds should be allowed to dry out and the fines removed and spread with the topsoil, unless the fines contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, dispose, and mitigate effects of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

The following table shows the various restrictions and closures applied to locatable minerals.

Areas Closed to Locatable Mineral Entry Non-discretionary

	NA	A	B	C	D	E	PA
Congressional Withdrawals	X	X	X	X	X	X	X
Other Non-BLM Agency Withdrawals	X	X	X	X	X	X	X
Reclamation Withdrawals	X	X	X	X	X	X	X
Designated Wilderness Areas	X	X	X	X	X	X	X
Designated Wild River Segment	X	X	X	X	X	X	X

Areas Closed to Locatable Mineral Entry Discretionary

	NA	A	B	C	D	E	PA
Pending BLM Application for Withdrawal	X	X	X	X	X	X	X
Lands Proposed for Exchange	X	X	X	X	X	X	X
R&PP Classification or Leases	X	X	X	X	X	X	X
Research Natural Area	X	X	X	X	X	X	X

Areas Open to Locatable Mineral Entry with Additional Restrictions

	NA	A	B	C	D	E	PA
Wilderness Study Area	X	X	X	X	X	X	X
Areas Designated for Potential Addition to the Wild and Scenic River System	X	X	X	X	X	X	X
Designated National Scenic/ Recreational River Segment	X	X	X	X	X	X	X
Placer Claims within Powersite Reservations or Classifications	X	X	X	X	X	X	X
Off-Road Vehicle Closures	X	X	X	X	X	X	X
ACECs	X	X	X	X	X	X	X
Community Pits	X	X	X	X	X	X	X
Federal Mineral Estate Only	X	X	X	X	X	X	X
Seral Stage Diversity Blocks			X				

Appendix II-K-2

Guidelines for Development of Salable Mineral Resources In the Coos Bay District

Quarry Design

Due to steep terrain in the operating area, most quarry developments will require a series of benches to effectively maximize the amount of mineral materials to be removed in a safe manner. In most cases, bench height should not exceed 40 feet, and if the bench will be used by bulldozers to access other parts of the quarry, the width of the bench should be at least 25 feet. If the bench is not used by equipment, then this width can be reduced to approximately 10 feet.

Clearing of timber and brush should be planned at least 10 feet beyond the edge of the excavation limit. Most often the brush will be piled and burned at the site, or scattered nearby.

If at all possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by mulching or seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an outslope of approximately two percent in order to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.

Operating Procedures

The following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the district:

- Oversized boulders shall not be wasted but shall be broken and utilized concurrently with the excavated material.
- The operator shall comply with local and state safety codes covering quarry operations, warning signs and traffic control. All necessary permits must be obtained from state and county agencies.
- Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a special use permit.

Areas Closed to Salable Mineral Activities on a Non-Discretionary Basis

	NA	A	B	C	D	E	PA
Wilderness Areas	X	X	X	X	X	X	X
Wilderness Study Areas	X	X	X	X	X	X	X
Corridors of Designated Wild Rivers	X	X	X	X	X	X	X

Areas Closed to Salable Mineral Activities on a Discretionary Basis

	NA	A	B	C	D	E	PA
Pending or Existing Withdrawals	X	X	X	X	X	X	X
ACECs	X	X	X	X	X	X	X
RNAs	X	X	X	X	X	X	X
RMAs	X	X	X	X	X	X	X
Corridors of Rivers Suitable for Designation as Wild, Scenic or Recreational			X	X	X	X	X
Corridors of Designated Scenic or Recreational Rivers	X	X	X	X	X	X	X
R&PP Leases	X	X	X	X	X	X	X
VRM Class I Areas	X	X	X	X	X	X	X
Off-Road Vehicle Closure Areas	X	X	X	X	X	X	X
Administrative Sites	X	X	X	X	X	X	X
Cultural Resource Sites	X	X	X	X	X	X	X

Areas Open to Salable Mineral Activities With Additional Restrictions

	NA	A	B	C	D	E	PA
Federal Mineral Estate Only	X	X	X	X	X	X	X
Seasonal Wildlife Restricted Areas	X	X	X	X	X	X	X
VRM Class II Areas	X	X	X	X	X	X	X
Forest Stands Older than 150 Years						X	
Old-Growth Restoration and Retention Blocks				X			
Habitat Conversion Areas for the Northern Spotted Owl						X	

Appendix II-L

Goals and Objectives of the Preferred Alternative

Goals:

- Provide a sustainable yield of forest products to:
  - Contribute to community stability consistent with maintenance of ecosystems and a diversity of indigenous species,
  - Contribute to the recovery of threatened and endangered species including the northern spotted owl, and
  - Maintain fish and wildlife habitat, water quality, recreational use, scenic values, and other uses on the land base.

Objectives:

- Produce a moderate sustainable yield of forest products.

- Maintain long-term soil productivity.

- Manage for biological diversity using a system that includes maintenance and development of mature and old-growth forests in areas considered most important for recovery of the northern spotted owl, and provides connectivity at subregional and regional levels.

- Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern. Manage habitat to maintain species population levels which would avoid endangering and enhance the recovery of species.

- Retain the existing ACEC, RNA, and Environmental Education Area, and designate new ACECs as needed to meet important needs.

- Manage riparian areas to provide substantial protection for anadromous fish habitat, water quality, wetlands, and other water environments.

- Provide for a wide range of developed and dispersed recreation opportunities, while reducing conflicts among recreation use groups.

- Find eligible river segments suitable for designation to the Wild and Scenic Rivers System as wild, scenic, or recreational, if they are manageable and the outstandingly remarkable values are not protected by other allocations.

- Manage the scenic resources adjacent to recreation sites, and state and federal highways, to retain scenic quality.

- Make land tenure adjustments to benefit a variety of uses and values.

- Adopt appropriate special forest management practices on BLM-administered lands close to rural interface areas zoned for residential occupancy.

Appendix II-M

Silvicultural Systems Utilized in Design of the Preferred Alternative

The silvicultural systems to be utilized in the Preferred Alternative (PA) are designed to meet the land use objectives for each of the three land use allocations: General Forest Management Areas (GFMA), Connectivity Areas (CA), and Old-Growth Emphasis Areas (OGEA). Objectives for each of the allocations include timber production, retention of biological diversity, connectivity of OGEAs between BLM districts and the Forest Service, creation of wildlife habitat, and maintenance of watershed conditions. The allocations are also designed to be consistent with the current conditions, physical site characteristics, and ecosystems of the lands to be managed.

The general prescription provides for flexibility in the level of structural retention, unit size, and spatial distribution of retained trees to match the requirements of individual stands and physical sites, as well as to provide for protection of non-timber resource values on individual sites. Site-specific analysis will determine which structural components (including live trees, snags, and large down-woody material) to retain. It will also determine whether the components should be clumped or distributed in various ways in the landscape.

Prescriptions are designed to retain or recreate biological legacy which resembles natural systems to a greater degree than do conventional even-aged systems. The prescriptions are not designed to simply retain specific structural components, but to provide for the retention of natural ecosystem processes and wildlife habitat niches. The Preferred Alternative is designed to retain biological diversity within the total forest landscape.

Management objectives for first and second order perennial streams, and for third order and larger streams, would be achieved through protection of riparian management areas.

Silvicultural practices proposed for the Preferred Alternative include all of the practices considered for the common alternatives, but the timing and design of treatments may be different.

Silvicultural practices would be used to maintain a relatively high level of timber productivity consistent with retention of structure and function in the managed landscape.

As in the common alternatives, the Preferred Alternative provides for salvage of mortality volume, but specific rules are set for salvage in different management areas. Features of the Preferred Alternative are designed to reduce the rate and amount of insect-caused disease and mortality, and to reduce the risk of catastrophic stand replacement by wildfire.

General Forest Management Areas (GFMAs)

In the GFMAs, the management objectives of silvicultural prescriptions would be to:

- Maximize a sustainable yield of forest products consistent with other management objectives for the GFMAs.
- Maintain riparian and aquatic ecosystems.
- Maintain long-term site productivity in a biologically diverse landscape.
- Retain a moderate amount of biological legacy.
- Provide cavity nesting habitat for dominant woodpeckers.

Site-specific structural retention levels, unit sizes, and arrangements of structures within stands would be designed to permit a relatively high level of timber production through the use of intensive forest management practices within a modified even-aged upland forest while protecting site-specific resource values. Maintenance of site productivity and wildlife habitat values would be achieved through the retention of structures and the design of practices and measures necessary to maintain ecosystem processes.

Prescription Details

The GFMAs, totaling 140,100 acres, would be managed under a 60-year minimum harvest age constraint, with a long-term goal of final harvest occurring at the culmination of mean annual increment (age 60 to 85). The general prescription is a modification of the even-aged management system. Regeneration harvests are modified clearcuts or shelterwood cuts in which an average of six large, green trees or snags per acre are retained along with down logs to meet long-term site productivity and wildlife habitat objectives throughout the management cycle. Regeneration harvest units would vary in size up to a maximum of 120 acres. The retained trees would proportionally represent the range of size classes larger than 20 inches in diameter and all species present, including large hardwoods, if present.

Green trees are retained to become future snags and down logs, acting to both maintain site productivity and to become wildlife habitat features. Reserved green trees may be girdled or topped during the rotation to meet excavator population objectives. Prior to causing mortality of large green trees, however, there would be an evaluation done to determine the need to reserve green structures within the forest, the need to meet long term down-wood objectives, and the expected natural levels of mortality over time.

Retained structures would not usually be uniformly distributed in harvested stands. The location of reserved trees would be varied or clumped according to the characteristics of stands and sites, and also relative to the need to provide protection to special features or to consider factors within the unit such as wildlife habitat features, wet areas, wind-firmness, logging systems, and fuel management plans. Additionally, the habitat of special status species would be protected by reserve tree arrangement within the unit, and by the design of both harvest and silvicultural operations.

One objective of stand management would be to retain habitat structure sufficient to meet the requirements for dominant woodpecker species at a minimum level of 60 percent of optimum population for the total landscape considering non-managed reserves. For pileated woodpeckers, the goal would be to provide structure for at least one pair every two miles.

The general sequence and types of silvicultural treatments used on stands managed under these prescriptions would be the same as those now used in even-aged management. However, aerial ignition for site preparation and aerial herbicide application may not be safely applied with this level of green tree retention. Silvicultural treatments would include site preparation, maintenance, release, precommercial thinning, fertilization, commercial thinning, and tree pruning. Precommercial thinning would generally occur between the age of 12 and 15. Fertilization would normally occur after precommercial thinning and about ten years prior to a commercial thinning. Pruning, if applied, would occur at approximately 15 to 25 years of age. Commercial thinning would be scheduled no earlier than ten years and generally closer to 20 years prior to final harvest.

Special Prescriptions

Visual Resource Management: For areas designed for VRM II management, the general prescription would be modified to retain a larger amount of overstory for a longer period of time as needed to mitigate for visual management. These prescriptions would provide a form of continuous canopy management.

Mortality Salvage: Mortality salvage of scattered or whole stand mortality would be accomplished under special silvicultural prescriptions to assure that enough standing and down mortality was retained to meet both snag retention and current and future down-wood objectives. Each prescription would consider how to meet reforestation and structural management objectives.

Stands Dominated by Tanoak: These prescriptions would be modified as required to meet the requirements of management of stands in which tanoak is a significant component. On these sites, regeneration units could be larger, and retained overstories grouped and less dispersed. Site-specific silvicultural prescriptions and environmental assessments would determine the spacing and grouping patterns. Regeneration cuts and retention levels would be designed to meet the objectives of the alternative at the stand and landscape level.

Connectivity Areas (CAs)

In the CAs, the management objectives of silvicultural prescriptions would be to:

- Produce a moderate sustained yield of forest products.
- Develop stands that have old-growth characteristics by age 120.
- Provide for dispersal habitat for old-growth dependent species by maintaining 50 percent of the area in mature seral stages (80 years or older).
- Provide for connectivity for mobile species between OGEAs on BLM and Forest Service ownership.

The Preferred Alternative design factors assure the retention of desired levels of habitat connectivity for old-growth dependent species within the general landscape. Connectivity areas as displayed on the Preferred Alternative Map provide linkage between the OGEAs, adjacent National Forests, and BLM districts. Lands managed for non-timber values (e.g., recreation sites, special areas, TPCC, and riparian management areas) provide additional connectivity throughout the landscape.

Prescription Details

The connectivity areas, totaling 22,800 acres, would be managed under a 150-year rotation, with the long-term goal of having a minimum of 50 percent of the area in mature (80 years or older) seral stage. The general prescription would be similar to that of the GFMAs.

Regeneration harvests are modifications of even-age systems in which an average of 12 green trees per acre are retained, in addition to snags and down logs required to meet site productivity and wildlife habitat objectives through the management cycle. Regeneration harvest units would vary in size up to a maximum of 120 acres.

Precommercial thinning and fertilization schedules would be similar to prescriptions in the GFMA. One or two density management entries would occur in stands between the ages of 40 and 80 within the CAs. Prescriptions for these entries would be site specific and would be based on stand age, composition, condition, and location; management objectives; and landscape features. In general, openings would be created in stands that would emulate natural disturbances. Crown closure would not be reduced below 60 percent during any one entry. Entries would normally be spaced about 30 years apart. Harvest volumes removed by density management treatments would vary between 12 and 25 MBF/acre.

Salvage in Connectivity Areas

Salvage would be permitted in the CA only if the salvageable material would not reduce the levels of snag down-wood onsite below the levels identified in Pacific Northwest Bulletin (PNW) 447.

Old-Growth Emphasis Areas (OGEAs)

In the OGEAs, the management objectives of silvicultural prescriptions would be to:

- Provide habitat for old-growth dependent species in the ways listed below.
  - Maintaining existing mature and old-growth stands for the next eight decades.
  - Maintaining at least 50 percent of OGEAs in a seral stage that has old-growth characteristics.
  - Developing future stands that would function as an old-growth stand by age 150.
- Support a regional biodiversity design.
- Produce a sustained yield of forest products subject to meeting the above objectives.

Old-Growth Emphasis Areas, totaling 80,500 acres, would be managed under strategies designed to achieve the most rapid recovery of old-growth and mature forest conditions possible.

Prescription Details

The OGEAs would be deferred from regeneration harvests for eight decades to allow for existing stands of mature timber to reach old-growth characteristics and to allow for at least 50 percent of the OGEA acres to have old-growth characteristics. An exception would be to allow limited hardwood conversion in the OGEAs. This would facilitate experimentation within the OGEAs about the value of silvicultural approaches for retention of old-growth habitat values. Regeneration harvests after the deferral period would utilize advancements in scientific knowledge. Regeneration harvests would generally follow the prescriptions for the GFMA, but would occur on an average rotation length of 300 years, and harvest units would not exceed 10 acres in size. Less than one percent of the total acres in the OGEA would be regeneration harvested each year after the eighth decade.

For subsequent decades, development of old-growth structural and functional characteristics would be accelerated through density management harvests in stands lacking those desired traits. Silvicultural prescriptions would be similar to those described for the CA.

Salvage in OGEAs

Salvage would be permitted if it was not detrimental to wildlife, was due to a catastrophic event, and was an operationally practical sale that could be designed to remove only the salvage volume above the amount needed to satisfy snag and down-wood levels identified in Pacific Northwest Bulletin (PNW) 447. In general, a catastrophic event is considered an event that significantly alters an area or the dominant vegetation and encompasses or occurs on at least 10 acres.

Fires in southwestern Oregon usually leave islands or scattered living trees (usually the largest trees). The salvage rules for such fires would require that all live trees and all patches of live trees be retained on the site. Dead-and down-wood in excess of the amount needed to meet PNW 447 guidelines could be removed.

Timber Harvest and Management Details of the Preferred Alternative.

Table II-M-1 displays the average annual harvest for the PA in both MMBF and MMCF.

Table II-M-2 displays the average annual harvest in both acres and MMCF from each of the management areas, and the amount of harvest associated with regeneration harvest and density management.

Table II-M-3 displays the acres of stand treatments assumed for selected decades.

Table II-M-1. Preferred Alternative Average Annual Harvest

Decade	MMCF	MMBF	MMBF/MMCF Ratio
1st	20.10	124.01	6.17
2nd	20.10	123.13	6.13
3rd	20.10	118.15	5.88
5th	20.10	115.09	5.72
10th	20.10	119.63	5.95

Table II-M-2. Expected Preferred Alternative Average Annual Harvest (acres and mmcf)

	Decade									
	1st		2nd		3rd		5th		10th	
	Ac.	MMCF	Ac.	MMCF	Ac.	MMCF	Ac.	MMCF	Ac.	MMCF
Old-Growth Emphasis Areas										
Regeneration Harvest	18	.03	21	.03	19	.03	1	.00	106	.98
Density Management	603	1.68	442	.98	852	1.92	1,393	3.50	26	.08
Connectivity Areas										
Regeneration Harvest	86	.59	59	.47	31	.23	26	.17	650	5.15
Density Management	14	.03	97	.21	422	.93	359	.87	59	.14
General Forest Management Areas										
Regeneration Harvest	2,212	16.97	2,290	17.26	1,846	15.96	1,345	12.40	1,063	12.07
Commercial Thinning	339	.80	482	1.15	438	1.03	1,381	3.16	727	1.68
Total	3,272	20.10	3,391	20.10	3,608	20.10	4,505	20.10	2,631	20.10

Table II-M-3. Preferred Alternative Assumed Stand Treatments by Decade (acres)

	Decade				
Treatment	1st	2nd	3rd	5th	10th
Plant Genet. Selected Stock	24,200	23,700	19,000	13,700	18,200
Competing Vegetation Control	49,000	30,200	23,100	17,500	23,100
Precommercial Thin (PCT)	24,600	30,400	6,800	16,300	12,400
Fertilization	48,800	64,700	66,200	59,700	40,500
Pruning	5,800	5,900	4,700	3,500	4,500

Appendix II-N

Wild and Scenic Rivers Suitability Assessments

Introduction

This appendix includes suitability assessments for seven of the eleven river segments previously found eligible for inclusion in the National Wild and Scenic Rivers System (NWSRS). The seven rivers are: Smith River, Wassen Creek, North Fork Coquille, East Fork Coquille, New River, South Fork Pistol, and North Fork Chetco. The primary reason for not assessing suitability on the other four segments (Umpqua, South Fork Coos, South Fork Coquille and Sixes River) is because BLM does not administer sufficient control, generally considered to be at least 15 percent of the study segment, to protect the values which made the rivers eligible. General background and other information on potential land acquisition, public involvement, suitability criteria, and comparative river segment quality that applies to each assessment is included in this introduction section.

Analysis of a river's potential for designation under the National Wild and Scenic Rivers Act involves three separate steps: determination of eligibility, classification, and suitability. Rivers or river segments can be classified as wild, scenic, or recreational. Final designation decisions are made by Congress.

To be eligible for designation, a river or river segment must be free-flowing and possess at least one outstandingly remarkable value. Eligibility and potential classification decisions were previously made in the planning process, which is documented and on file at the district office.

Appendix II-G contains eligibility and classification criteria used in that process. All river segments included in this appendix are within State Comprehensive Outdoor Recreation Plan (SCORP) Regions 6 and 9 (see Map II-N and Tables II-N-1 and II-N-2). Eleven streams were reviewed to fulfill analysis requirements for eligibility determination. A summary of eligibility and highest potential classification is shown in Chapter 3, Table 3-WS-2. Suitability findings by alternative are shown in Chapter 2, Table 2-10.

Criteria specified in Section 4(a) of the Wild and Scenic Rivers Act provides a basis for suitability assessment. These criteria are specifically addressed in the seven individual suitability assessments and are as follows:

1. Current status of land ownership and use in the area.
2. Reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the NWSRS.
3. Estimated cost to the United States of acquiring necessary land and interest in land, and of administering the area should it be added to the system.
4. Extent to which the costs thereof would be shared by state and local agencies.
5. Federal agency which should administer the river.
6. Characteristics that do, or do not, make the area a worthy addition to the system.

In the Analysis of the Management Situation Summary we stated a separate Legislative Environmental Impact Statement (LEIS) would be prepared for river or river segments found suitable for designation as a component of the NWSRS. The LEIS would have been the method of forwarding the district findings and recommendations to Congress. Since then, however, we have decided that this RMP/EIS will serve as the only EIS to analyze suitability findings and make recommendations for inclusion in the NWSRS.

Interim management would be provided, as necessary to protect identified Outstandingly Remarkable Values (ORVs), on all BLM-administered land within 0.25 miles on both sides of those river segments found eligible but not assessed for suitability, and those segments assessed and found suitable. This interim management will continue until a final determination is made by Congress.

The federal government does not manage, nor have zoning authority over, private land within designated wild, scenic or recreational river areas designated under the Act. The federal government's authority to affect private lands is primarily through the acquisition authorities conferred in the Wild and Scenic Rivers Act. Except for the acquisition of land or interest in lands, for which just compensation is made, this law does not enable agencies to regulate the use of private property. Specifically, section 6(b) of the Wild and Scenic Rivers Act prohibits federal

Table II-N-1. Outstandingly Remarkable Values on Eligible River Segments in SCORP Region 6.

River Segment	Rec.	Geo.	F&W	Scn.	Cul.	His.	Other [1]
South Fork Coos R.	X		X				
North Fork Coquille R.			X		X		
East Fork Coquille R.			X				
South Fork Coquille R.			X		X		
New River		X	X	X			X
Sixes River			X			X	
South Fork Pistol R.			X				
North Fork Chetco R.			X		X		

[1] Other values include but are not limited to hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities.

Abbreviations used in this table

Rec = Recreation
Geo = Geologic
F&W = Fish and Wildlife
Scn = Scenic
Cul = Cultural
His = Historic

Table II-N-2. Outstandingly Remarkable Values on Eligible River Segments in SCORP Region 9.

River Segment	Rec.	Geo.	F&W	Scn.	Cul.	His.	Other [1]
Smith River			X				
Wassen Creek			X				X
Umpqua River	X	X	X	X			X

[1] Other values include but are not limited to hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities.

Abbreviations used in this table

Rec = Recreation
Geo = Geologic
F&W = Fish and Wildlife
Scn = Scenic
Cul = Cultural
His = Historic

condemnation to purchase fee title lands when 50 percent or more of a designated river corridor is public land (i.e., federal, state, or county). However, section 6(b) does allow the use of condemnation to purchase scenic easements as a measure of last resort to remove or prevent a threat to the river or its ORVs.

Private land ownership is permissible within designated river boundaries, and existing private land uses are often consistent with wild, scenic, or recreational rivers management goals. When carefully conducted, activities such as ranching, farming, mining, and forest management may continue within the areas classified as "Scenic" and "Recreational". Assistance to private landowners may be provided by the federal government to encourage practices that enhance the river's natural values (e.g., water quality and quantity, streambank stability, and riparian habitat).

There has been minimal public involvement concerning the suitability of rivers found eligible for potential designation. Most local comments were negative regarding designation, with concerns expressed about the use of special interest publications to justify suitability, de facto designation through interim management, use of water for recreational purposes taking precedence over future industrial needs, impacts to logging and farming on private lands, and the low percentage of BLM-administered lands on most of the rivers found eligible. Some positive comments were received, however, from special interest groups representing regional concerns, including the Oregon Natural Resource Council and American Rivers Council.

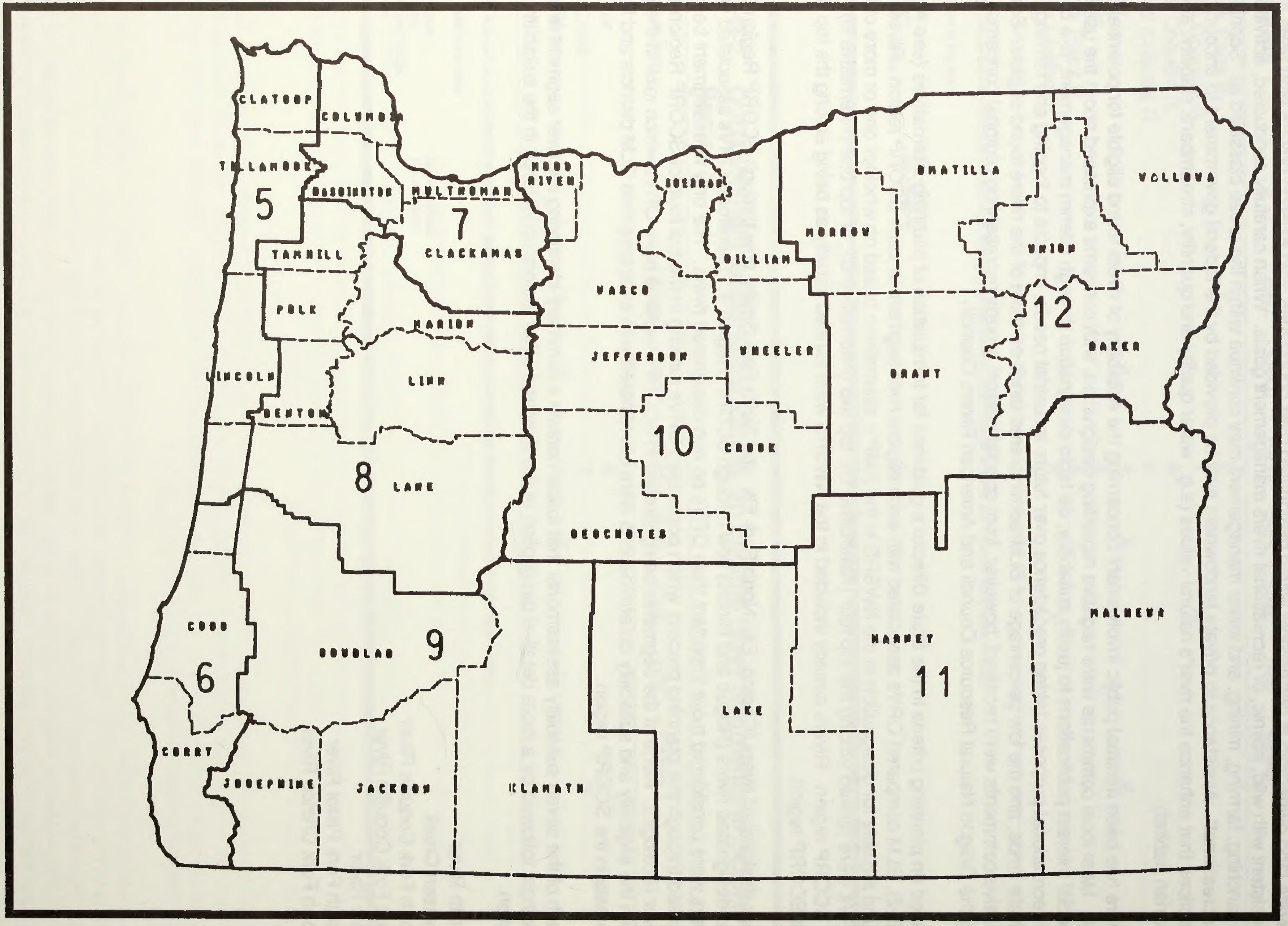
Based on planning criteria in the State Director's guidance for formulation of planning alternatives (see Appendix II-B-2), BLM compared ORVs associated with each eligible river segment in each SCORP region. Rivers were found suitable for designation in the NWSRS in the RMP's alternatives based on whether one or more of their ORVs were ranked among the top four (Alternative D), top two (Alternative C), or top one (Alternative B) rivers in its SCORP region. Rivers already included in the NWSRS were ranked equally as being among the top rivers in the SCORP region.

Four designated rivers (Chetco, Elk, North Fork Elk, and North Fork Smith) flow through SCORP Region 6 and two designated rivers (Rogue and Illinois) flow through SCORP Region 9. Therefore, ORVs associated with these rivers were considered more important than ORVs on non-designated rivers. The only river segment being studied through this planning process which possesses ORVs ranking in the top four for SCORP Region 6 is New River (ecologic). None of the segments being studied in SCORP Region 9 have ORVs which rank in the top four. Both the eligibility and suitability determinations were coordinated with all appropriate BLM districts and National Forests in the SCORP region.

Each of the seven suitability assessments that follow contain a summary identifying the river segment and the findings, followed by a more detailed description of the river and other factors considered in the suitability determination.

Smith River
Wassen Creek
North Fork Coquille River
East Fork Coquille River
New River
South Fork Pistol River
North Fork Chetco River

Map II-N. Oregon SCORP Planning Regions



Appendix II-N-1

Smith River

I. Summary

The 61-mile segment of Smith River from the district boundary in T. 21 S., R. 7 W., Sec. 6, Will. Mer., to the confluence with the Umpqua River in T. 21 S., R. 12 W., Sec. 35, Will. Mer., is found nonsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

The district identified as eligible a 61-mile segment from the district boundary in T. 21 S., R. 7 W., Sec. 6, Will. Mer., to the confluence with the Umpqua River in T. 21 S., R. 12 W., Sec. 35, Will. Mer. (See Map II-N-1.) Major tributaries feeding into the river include Big Creek, North and South Sisters Creeks, West Fork Smith River, Vincent Creek, Wassen Creek, North Fork Smith River, there are also a multitude of smaller tributaries. Located along the identified segment are several recreation sites which include three boat ramps (one BLM, one U.S. Forest Service [USFS] and one private), South Side County Park, Noel Ranch Recreation Site (USFS), Smith River Falls Recreation Site (BLM), Vincent Creek Recreation Site (BLM) and Twin Sisters Recreation Site (private). The river lies within the Coast Range, within Statewide Comprehensive Outdoor Recreation Plan (SCORP), Region 9. Parts of the river corridor (0.25 mile each side of the river) have been clearcut while other parts are covered with Douglas-fir and alder forests. Public access to the river is provided by Smith River County Road which parallels the river for the first 13 miles of the segment, and the Smith River Access Road (BLM) which parallels the remainder of the segment.

Popular swimming areas (Smith River Falls and Vincent Creek) attract local residents to the area. Several undeveloped camping sites located along the upper portion of the river are utilized by local residents. The river's fishing opportunities attract local visitors, including both bank and drift boat fishermen.

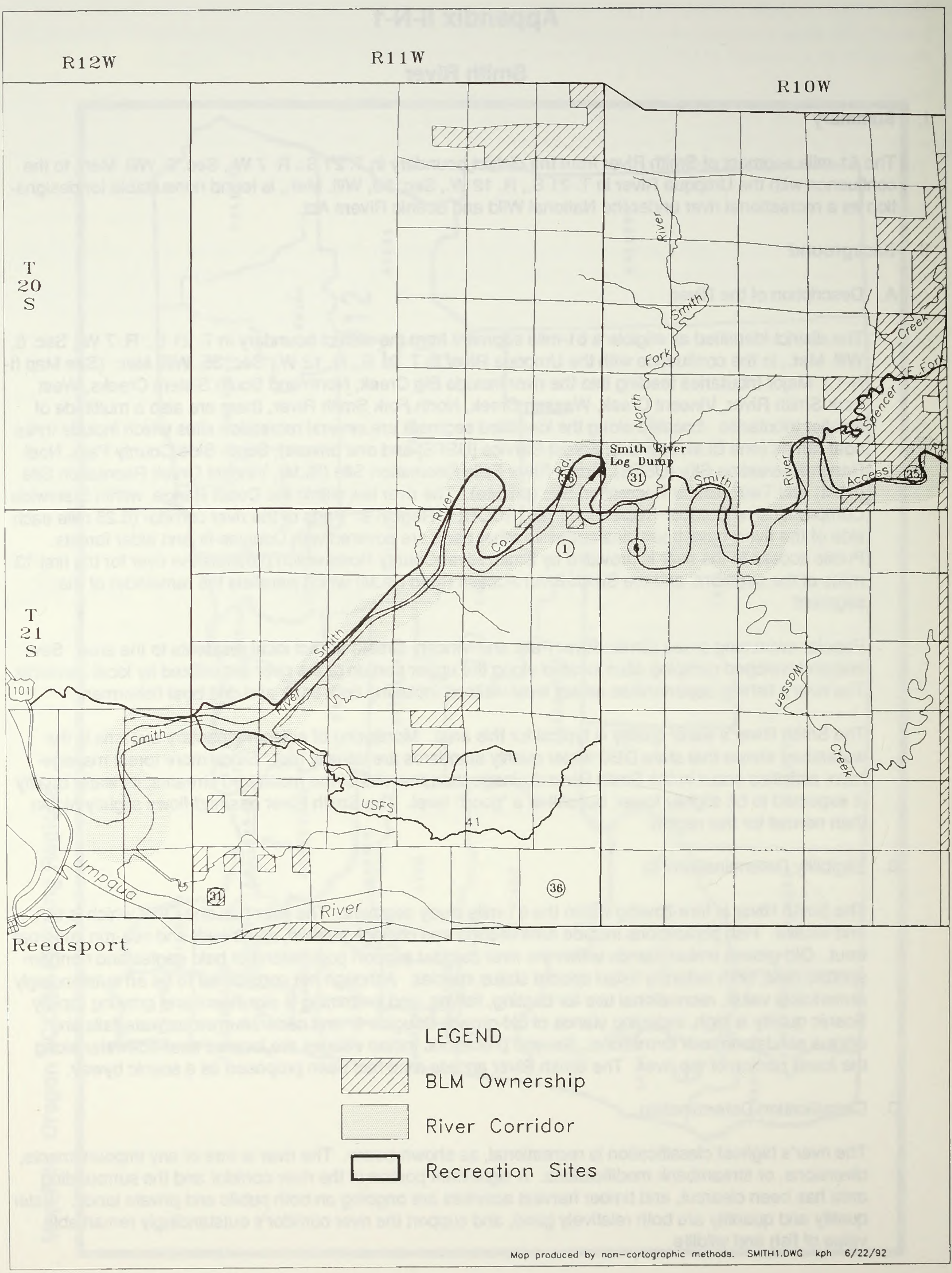
The Smith River's water quality is typical for this area. Monitoring of adjacent tributary streams in the watershed shows that state DEQ water quality standards are usually met. Since more forest management activities occur in the Smith River drainage than in areas of the monitored streams, its water quality is expected to be slightly lower, but still at a "good" level. The Smith River has had flows slightly higher than normal for this region.

B. Eligibility Determination

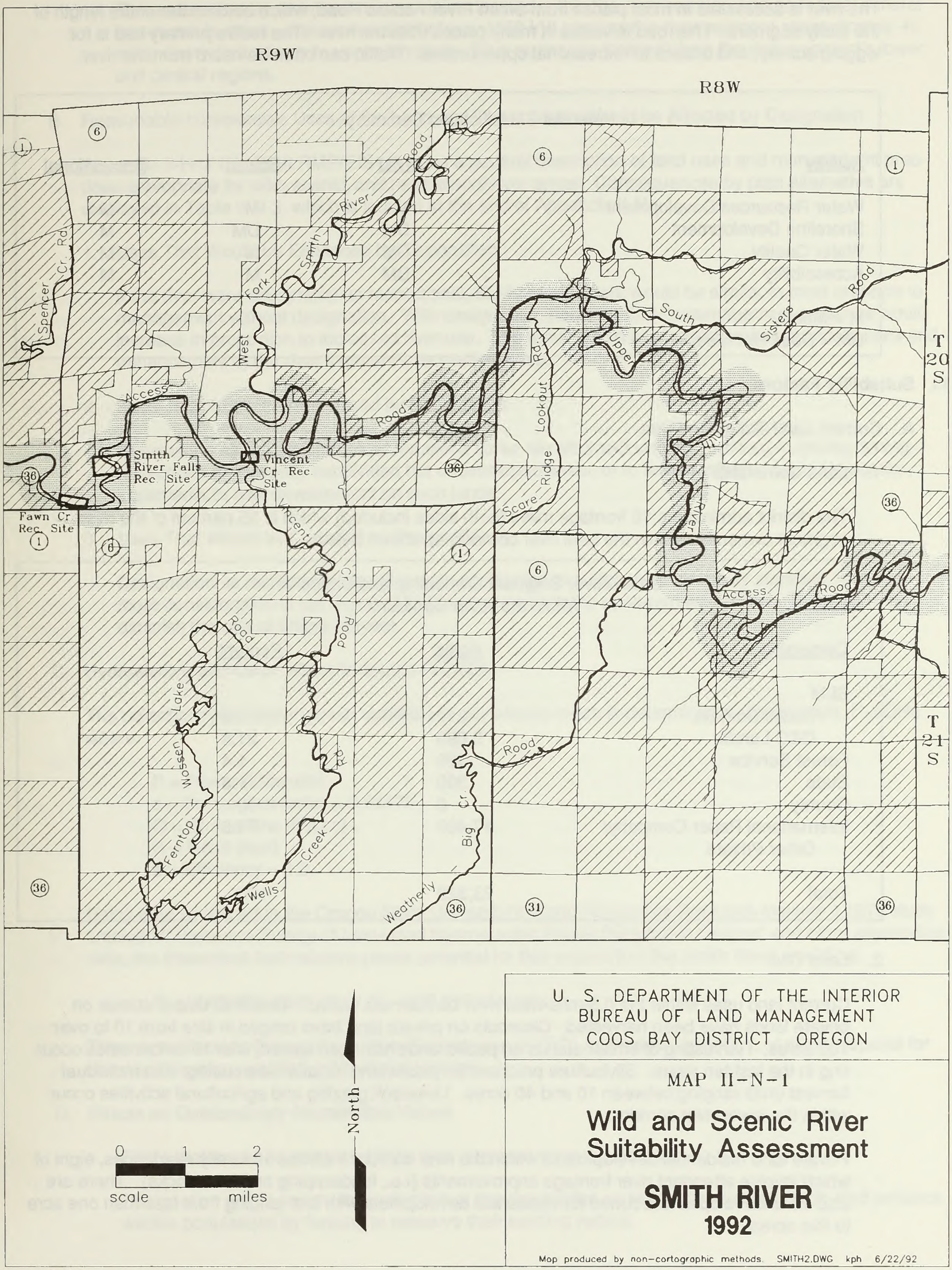
The Smith River is free-flowing within the 61-mile study segment. The river has one ORV which is fish and wildlife. Fish populations include runs of coho and chinook salmon, steelhead, and sea-run cutthroat trout. Old-growth timber stands within the river corridor support populations of bald eagles and northern spotted owls, both federally listed special status species. Although not considered to be an outstandingly remarkable value, recreational use for boating, fishing, and swimming is significant and growing rapidly. Scenic quality is high, including stands of old-growth Douglas-fir and cedar, numerous waterfalls and unique sandstone rock formations. Several prehistoric Indian villages are located near tidewater along the lower portion of the river. The Smith River access road has been proposed as a scenic byway.

C. Classification Determination

The river's highest classification is recreational, as shown below. The river is free of any impoundments, diversions, or streambank modifications. A significant portion of the river corridor and the surrounding area has been clearcut, and timber harvest activities are ongoing on both public and private lands. Water quality and quantity are both relatively good, and support the river corridor's outstandingly remarkable value of fish and wildlife.



Map produced by non-cartographic methods. SMITH1.DWG kph 6/22/92



U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
COOS BAY DISTRICT OREGON

MAP II-N-1

Wild and Scenic River Suitability Assessment

SMITH RIVER
1992

Map produced by non-cortographic methods. SMITH2.DWG kph 6/22/92

The river is accessible in most places from Smith River Access Road, which borders the entire length of the study segment. This road is visible in many places from the river. The road's primary use is for logging activity, and access to recreational opportunities. Traffic can often be heard from the river.

Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	DM	M
Water Quality	DM	M	M
Accessibility	DM	M	M

M = Meets
DM = Does Not Meet

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The district administers 15 frontage miles (both sides included) which is 25 percent of the river segment ownership within the total river corridor, as shown below.

Smith River Segment Ownership and Status
Within the River Corridor

Ownership	Acres	Percent
BLM		
Public Domain	210	.9
O&C Lands	5,090	21.8
Forest Service	320	1.4
State	300	1.3
County	0	0
International Paper Company/ Other Private	17,400	74.6
Total	23,320	100

2. Land Use

Current land uses within the 0.5-mile-wide river corridor are varied. Almost all timber stands on private lands have been harvested. Clearcuts on private land have ranged in size from 10 to over 100 acres. Harvesting of timber stands on public lands has been limited, with 10 timber sales occurring in the last ten years. Silviculture practices on public land include clearcutting, with individual harvest units ranging between 10 and 40 acres. Livestock grazing and agricultural activities occur within the lower river corridor.

Private land residential developments within the river corridor includes 10 family residences, eight of which involve attendant river frontage improvements (i.e., landscaping and boat docks). There are also 20 undeveloped lots zoned for residential development with lots ranging from less than one acre to five acres.

There are currently no known mining claims located within the river corridor, and no federal mineral leases are in effect. A powerline right-of-way (100-kV) crosses the river segment approximately 40 miles downstream from its upper terminus. Boat ramps are located along the river segment's lower and central regions.

B. Reasonable Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of Appendix II-N.

1. Uses That Would be Enhanced by Designation

If the river were designated as recreational, BLM management would be similar in most respects to management without designation. With designation, however, BLM's management presence would increase in proportion to increased river use. The result would be diminished inappropriate uses and enhancement of the river segment's recreational use.

2. Uses That Would be Foreclosed by Designation

Designation as recreational could foreclose some development options resulting in county zoning restrictions on currently subdivided but undeveloped lands, or to federal efforts to acquire scenic easements to limit development on such lands.

3. Uses That Would be Curtailed by Designation

Designation as recreational would lead to application of a higher water quality standard, requiring more consideration in the timing of BLM timber sales in the upstream watershed. This could also diminish the rate of timber harvest.

C. Hydroelectric and Other Water Diversion Potential

The potential hydroelectric power available in any stream reach is determined by the formula P=cQHe where:

P = Power (kilowatts)
c = Conversion factor = 0.08475
Q = Streamflow (ft^3/sec)
H = Head (feet)
e = Efficiency = 1.0

Using data contained in the Oregon State University's Water Resources Research Institute's 1979 study entitled "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon" and other appropriate data, the theoretical hydroelectric power potential for this segment of the Smith River would be:

P = (0.08475) (868) (5) (1.0) = 367.815 kilowatts

There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposal for dams or diversions on file for this river segment.

D. Effects on Outstandingly Remarkable Values

1. ORVs that would be enhanced if the river segment were designated.

Designation would ensure the protection of riparian habitat on BLM-administered lands, and enhance wildlife populations by helping to preserve their existing habitat.

Bald eagle and northern spotted owl habitat and nesting would continue to be protected by the Endangered Species Act, and management of riparian areas would provide appropriate protection of fisheries habitat.

2. ORVs Expected to be Diminished if River Segment were not designated.

Private timber lands would continue to be harvested without giving consideration to recreational values on the river. Riparian zones would be afforded some protection under the Oregon Forest Practices Act. However, old-growth dependent wildlife species and some fish populations could suffer adverse effects.

E. How the River Segment Would be Managed if not Designated

If the river were not added to the NWSRS, its level of public visibility would not be increased and management would continue for existing levels of recreational use. Riparian, fisheries, and watershed values would continue to be protected. Timber harvest could occur outside riparian zones subject to inventoried VRM classes guidelines. Scenic attributes of the river viewshed may be diminished.

If the river were added to the NWSRS as recreational, management would be similar to that if it were not designated. Increased public use due to its higher visibility could require more management of recreational use.

Proposed designation of the Smith River Access Road as a scenic by-way could greatly increase recreational use of the river corridor.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing condition. If a land use or development clearly threatens the ORVs which resulted in the river's designation, efforts will be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation is necessary, the only landowner rights subject to purchase would be those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORV, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats and protection mechanisms, estimated costs of acquiring necessary lands or interests in lands will be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward and stated they would be willing to share in the cost of administering this river segment should it become part of the NWSRS. It is also unlikely, considering the financial constraints imposed by Oregon Ballot "Measure 5," that any state or local government agency would share in these costs.

G. Administering Agency

If the Smith River were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 61-mile segment of the Smith River from the district boundary to the confluence with the Umpqua River is found nonsuitable for federal designation as a recreational river under the Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System.

The low comparative rating of the river's ORV makes it a marginal potential addition to the National Wild and Scenic Rivers System. The fish and wildlife ORV is typical of rivers in the region. BLM's intent in the preferred alternative of this Draft RMP/EIS to protect this ORV on BLM-administered land indicates that designation is not needed to protect those values. The ORV is not threatened by dam construction or irrigation development. On private land not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect the ORV from impacts associated with timber management.

In addition, although county zoning does permit additional development of private lands on the county road fronting the river, such development would probably affect the ORV only slightly. The local opposition to such designation, coupled with the lack of any major public support, reinforces the conclusion of nonsuitability. Considering all the factors, BLM believes the river segment's ORV can best be protected by a combination of the actions set forth in the preferred alternative of this Draft RMP/EIS, and by management of private land consistent with county zoning and state law.

Appendix II-N-2

Wassen Creek

I. Summary

The four-mile segment of Wassen Creek from the headwaters at the outlet of Wassen Lake in T. 21 S., R. 9 W., Sec. 17, Will. Mer., to the Forest Service boundary in T. 21 S., R. 10 W., Sec. 11, Will. Mer., is found nonsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

The district identified as eligible a four-mile segment of Wassen Creek from the headwaters at Wassen Lake in T. 21 S., R. 9 W., Sec. 17, Will. Mer., to the USFS boundary with Smith River in T. 21 S., R. 10 W., Sec. 11, Will. Mer. (See Map II-N-2.) Tributaries feeding into Wassen Creek include Perkins Creek. Opportunities for access are limited and recreational use is very light.

Most of the four-mile stream corridor (0.25 mile on each side of the stream) is essentially in a natural condition. Parts of the upper stream corridor have been clearcut, while other parts and all of the central portion have mature or old-growth Douglas-fir and alder forests. Public access to the upper portions of the segment is provided by the Smith River Access Road, Wassen Lake Road and Wassen Ridge Road.

Wassen Creek has good water quality that is typical for this area. Monitoring of other adjacent tributary streams in the watershed shows that state DEQ water quality standards are usually met. Forestry management activities in the Wassen Creek drainage are less than on the monitored streams, and therefore water quality is expected to be good. Wassen Creek has had flows slightly higher than normal for this region.

B. Eligibility Determination

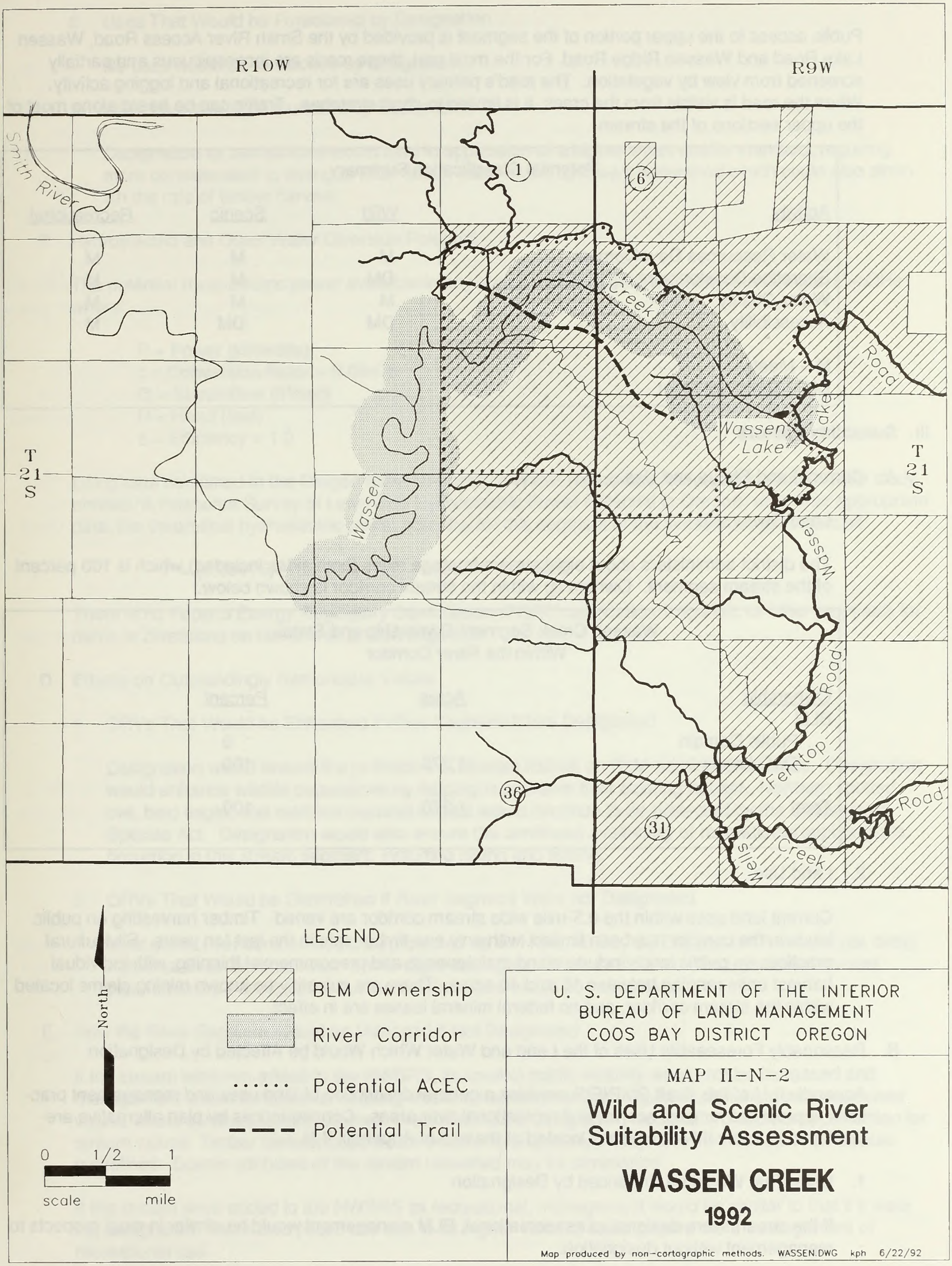
Wassen Creek is free-flowing within the four-mile study segment, and has two ORVs; fish and wildlife, and ecologic. Since most of the stream corridor is unharvested, wildlife values are high. Many old-growth dependent wildlife species are found here, including the pine marten. There are at least two active spotted owl nests within or in close proximity to the corridor. The federally threatened bald eagle forages along Wassen Creek, and the candidate federally-threatened marbled murrelet is suspected to nest within the corridor. Opportunities for scientific studies of unique species are considered to be high.

With the riparian zone mostly intact, the ecology of the stream corridor is nearly pristine. The area was included in the revised 1988 Oregon Natural Heritage plan, and is currently filling two of the state's Research Natural Area (RNA) cell needs: Terrestrial Ecosystem No. 13 (Douglas-fir/salal, 100-150 years old burn); and Freshwater Aquatic Ecosystem No. 7 (Waterfall/pool system on basalt/sedimentary rock in western hemlock zone). According to the Nature Conservancy there are few, if any, relatively undisturbed areas such as Wassen Creek in the Coast Range.

USFS lands downstream from the stream corridor are presently managed as a primitive unroaded area, and are being considered for scenic designation under the National Wild and Scenic Rivers Act.

C. Classification Determination

The stream's highest potential classification is recreational, as shown below. The stream is free of any impoundments, diversions, or streambank modifications. Parts of the upper stream corridor have been clearcut. The stream corridor contains no residential dwellings or associated structures. Water quality and quantity are both good, and support the stream corridor's outstandingly remarkable values.



U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
COOS BAY DISTRICT OREGON

MAP II-N-2

Wild and Scenic River Suitability Assessment

WASSEN CREEK

1992

Map produced by non-cartographic methods. WASSEN.DWG kph 6/22/92

Public access to the upper portion of the segment is provided by the Smith River Access Road, Wassen Lake Road and Wassen Ridge Road. For the most part, these roads are inconspicuous and partially screened from view by vegetation. The road's primary uses are for recreational and logging activity. When the road is visible from the creek, it is limited to short stretches. Traffic can be heard along most of the upper sections of the stream.

Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	M	M
Water Quality	M	M	M
Accessibility	DM	DM	M

M = Meets
DM = Does Not Meet

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The district administers about eight stream frontage miles (both sides included) which is 100 percent of the stream segment. Ownership within the stream corridor is shown below.

Wassen Creek Segment Ownership and Status
Within the River Corridor

Ownership	Acres	Percent
BLM		
Public Domain		0
O&C Lands	1,370	100
Total	1,370	100

2. Land Use

Current land uses within the 0.5-mile wide stream corridor are varied. Timber harvesting on public lands in the corridor has been limited, with only one timber sale in the last ten years. Silvicultural practices on public lands include stand maintenance and precommercial thinning, with individual harvest units ranging between 10 and 40 acres. There are currently no known mining claims located within the stream corridor, and no federal mineral leases are in effect.

B. Reasonably Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of Appendix II-N.

1. Uses That Would be Enhanced by Designation

If the stream were designated as recreational, BLM management would be similar in most respects to management without designation.

2. Uses That Would be Foreclosed by Designation

No uses would be foreclosed by designation.

3. Uses That Would be Curtailed by Designation

Designation as recreational would lead to application of a higher water quality standard, requiring more consideration to timing of BLM timber sales in the upstream watershed which could also diminish the rate of timber harvest.

C. Hydroelectric and Other Water Diversion Potential

The potential hydroelectric power available in any stream reach is determined by the formula P=cQHe where:

P = Power (kilowatts)
c = Conversion factor = 0.08475
Q = Streamflow (ft^3/sec)
H = Head (feet)
e = Efficiency = 1.0

Using data contained in the Oregon State University's Water Resources Research Institute's 1979 study entitled "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon" and other appropriate data, the theoretical hydroelectric power potential for this segment of the Wassen Creek would be:

$$P = (0.08475)\ (168)\ (66)\ (1.0) = 939.708 \text{ kilowatts}$$

There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this stream segment.

D. Effects on Outstandingly Remarkable Values

1. ORVs That Would be Enhanced if River Segment Were Designated

Designation would ensure the protection of riparian habitat on BLM-administered lands. Designation would enhance wildlife populations by helping to preserve their existing habitat. Northern spotted owl, bald eagle, and marbled murrelet habitat would continue to be protected by the Endangered Species Act. Designation would also ensure the continued availability of recreational opportunities occurring in this stream segment, including hiking and fishing.

2. ORVs That Would be Diminished if River Segment Were not Designated

Most of the river corridor would be protected as an HCA, ACEC, OGEA, and RMA, even if not designated as a recreational river. Some slight damage to ORVs could occur through timber harvest planned in the next decade, but the ORVs values would be maintained.

E. How the River Segment Would be Managed if Not Designated

If the stream were not added to the NWSRS, its level of public visibility would not be increased and management would continue for existing levels of recreational use. Riparian, fisheries, and watershed values would continue to be protected. Proposed ACEC designation would afford additional protection for stream values. Timber harvest could occur outside riparian zones subject to inventoried VRM classes guidelines. Scenic attributes of the stream viewshed may be diminished.

If the stream were added to the NWSRS as recreational, management would be similar to that if it were not designated. Increased public use due to its higher visibility could require more management of recreational use.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing condition. If a land use or development were to clearly threaten the ORVs which resulted in the river's designation, efforts would be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation is necessary, the only landowner rights subject to purchase would be those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORVs, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, the estimated costs of acquiring necessary lands or interests in lands will be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward stating willingness to share in the cost of administering this stream segment should it become part of the NWSRS. It is also unlikely, considering the financial constraints imposed by Oregon Ballot "Measure 5" that any state or local government agencies would share in these costs.

G. Administering Agency

If Wassen Creek were added to the NWSRS, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The four-mile segment of Wassen Creek from its headwaters at the outlet of Wassen Lake to the USFS boundary is found nonsuitable for federal designation as a recreational river under the National Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System

The four-mile segment of Wassen Creek is found nonsuitable for federal designation as a recreational river under the Wild and Scenic Rivers Act. The low comparative rating of the stream's two outstandingly remarkable values makes it a marginal potential addition to the National Wild and Scenic Rivers System. The BLM's ability and intent (in the Resource Management Plan Preferred Alternative) to protect these ORVs on lands it administers through ACEC status indicate that designation may not be needed to protect these values. The ORVs are not threatened by dam construction nor irrigation development. Local opposition to designation, coupled with the lack of any major public support, reinforces the conclusion of nonsuitability. Considering the above factors, BLM believes the stream's ORVs can best be protected by a combination of the actions set forth in its RMP preferred alternative.

Appendix II-N-3

North Fork Coquille River

I. Summary

The 42-mile segment of the North Fork Coquille River from the headwaters in T. 26 S., R. 10 W., Sec. 16, Will. Mer., to the confluence with the South Fork Coquille River in T. 29 S., R. 12 W., Sec. 5, Will. Mer., is found nonsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River.

The district identified as eligible a 42-mile segment of the North Fork Coquille from the headwaters in T. 26 S., R. 10 W., Sec. 16, Will. Mer., to the confluence with the South Fork Coquille River in T. 29 S., R. 12 W., Sec. 5, Will. Mer. (See Map II-N-3.) Tributary streams to the North Fork include Giles Creek, Moon Creek, Hudson Creek, Evans Creek, Middle Creek, and the East Fork Coquille River.

Parts of the river corridor (0.25 mile each side of the river) have been clearcut while other parts have Douglas-fir and alder forests. Portions of several county roads parallel the river for 29 miles of the segment, helping to provide public access to the river. Public access is limited on the upper portion above Steelhead Falls.

Recreational use of the North Fork is considerable and continues to increase. Laverne County Park attracts both regional and local residents to the river for camping, swimming, fishing, and picnicking. Year-round fishing opportunities attract both driftboat and bank anglers.

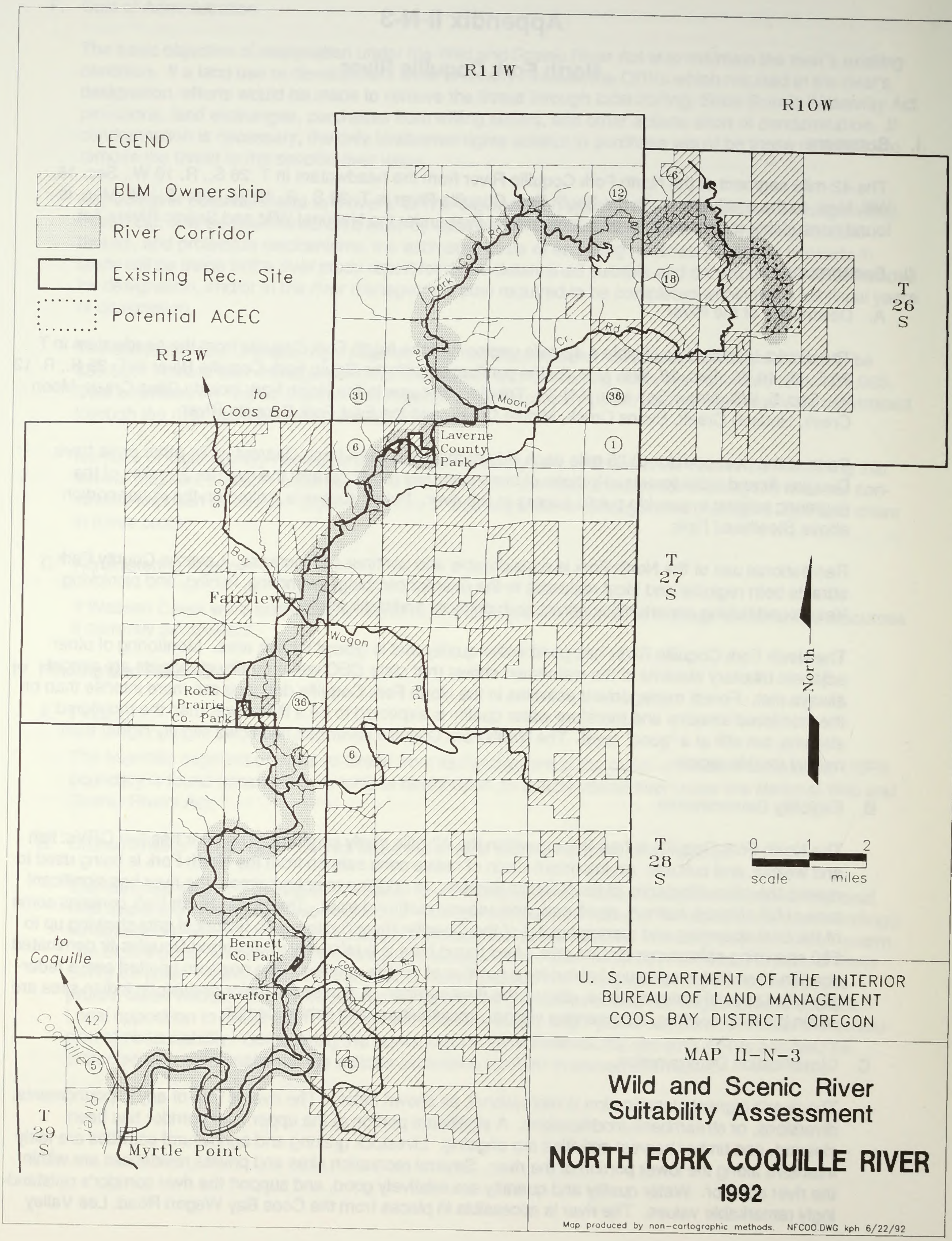
The North Fork Coquille River has good water quality that is typical for this area. Monitoring of other adjacent tributary streams in the watershed shows that state DEQ water quality standards are almost always met. Forest management activities in the North Fork Coquille drainage are more intense than on the monitored streams and therefore water quality is expected to be a little lower than the monitored streams, but still at a “good” level. The North Fork Coquille River has had flows slightly higher than normal for this region.

B. Eligibility Determination

The North Fork Coquille is free-flowing within the 42-mile study segment. The river has two ORVs: fish and wildlife, and cultural. An important strain of native coho salmon from the North Fork is being used to reseed the other tributaries of the Coquille System. In addition to coho salmon, the river has significant runs of fall chinook salmon, steelhead, and sea-run cutthroat trout. The Upper North Fork contains some of the best spawning and rearing habitat of the Coquille River System with historical data showing up to 500 spawning salmon per stream mile. Also found here is a relatively undisturbed Douglas-fir dominated riparian zone that is optimum habitat for a number of wildlife species. The northern spotted owl, a federally listed special status species, utilizes the river corridor. A number of major prehistoric Indian sites are within the river corridor, representing villages, rockshelters, and fishing camps.

C. Classification Determination

The river's highest classification is recreational, as shown below. The river is free of any impoundments, diversions, or streambank modifications. A significant portion of the upper river corridor has been clearcut, and timber harvest activities are ongoing. Livestock grazing and agricultural activities are fairly intensive along the lower portion of the river. Several recreation sites and private residences are within the river corridor. Water quality and quantity are relatively good, and support the river corridor's outstandingly remarkable values. The river is accessible in places from the Coos Bay Wagon Road, Lee Valley


LEGEND
BLM Ownership
River Corridor
Existing Rec. Site
Potential ACEC
R11W
R10W
R12W
T 26 S
T 27 S
T 28 S
T 29 S
to Coos Bay
to Coquille
Laverne County Park
Rock Prairie Co. Park
Bennett Co. Park
Fairview
Gravelford
Myrtle Point
Coos Bay Wagon Rd
Park Cr. Rd
Laverne
Moon Cr. Rd
Coquille River
N. F. Coquille
42
North
0 1 2
scale miles
6
12
18
31
36
1
5
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BUREAU OF LAND MANAGEMENT
COOS BAY DISTRICT OREGON
MAP II-N-3
Wild and Scenic River
Suitability Assessment
NORTH FORK COQUILLE RIVER
1992
Map produced by non-cartographic methods. NFCOO.DWG kph 6/22/92

County Road, and the North Fork County Road. The North Fork Road parallels the river for over eight miles. For the most part, these roads are inconspicuous and well-screened from the river's view by vegetation. Primary uses include logging and agricultural activities, recreational travel to Laverne County Park, and access to local residences. Several stretches of the roads are visible from the river which is crossed by five bridges. Traffic can often be heard from the river.

Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	DM	M
Water Quality	DM	M	M
Accessibility	DM	DM	M

M = Meets
DM = Does Not Meet

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The district administers six stream-frontage miles (both sides included) which is 14 percent of the river segment. Ownership over the total river segment is shown below.

North Fork Coquille River Segment Ownership and Status
Within the River Corridor

Ownership	Acres	Percent
BLM		
Coos Bay Wagon Road	1,300	9
Public Domain	0	0
O&C Lands	1,400	9.7
Forest Service	0	0
State	0	0
County	240	0.7
Timber Companies and Individuals	11,490	79.6
Total	14,430	100

2. Land Use

Current land uses within the 0.5-mile wide river corridor are varied. Timber harvesting on private lands is nearly complete. Timber harvesting on public lands has been limited, with five timber sales in the last ten years. Silviculture practices on public lands include clearcutting, with individual harvest units ranging between 20 acres and 60 acres. Livestock grazing and agricultural activities occur on private land within the river corridor.

Private land residential developments within the river corridor include 30 family residences, 20 of which involve attendant river frontage improvements (i.e., landscaping and boat dock). There are also 20 undeveloped lots zoned for residential development. Private residential lots range in size from less than one acre to five acres.

There are currently no known mining claims located within the river corridor, and no federal mineral leases are in effect. A powerline right-of-way (100-kV) crosses the river segment approximately 20 miles downstream from its upper terminus. Unimproved boat ramps are located near the river segment's upper and lower termini.

B. Reasonable Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of Appendix II-N.

1. Uses That Would be Enhanced by Designation

If the river were designated as recreational, BLM management would be similar in most respects to management without designation. With designation, however, BLM's management presence would increase in proportion to increased river use. The result would be diminished inappropriate uses and enhancement of the river segment's recreational use.

2. Uses That Would be Foreclosed by Designation

Designation as recreational could foreclose some development options resulting in county zoning restrictions on currently subdivided but undeveloped lands, or to federal efforts to acquire scenic easements to limit development on such lands.

3. Uses That Would be Curtailed by Designation

Designation as recreational would lead to application of a higher water quality standard, requiring more consideration in the timing of BLM timber sales in the upstream watershed. This could also diminish the rate of timber harvest.

C. Hydroelectric and Other Water Diversion Potential

The potential hydroelectric power available in any stream reach is determined by the formula $P=cQHe$

P = Power (kilowatts)
c = Conversion factor = 0.08475
Q = Streamflow (ft^3/sec)
H = Head (feet)
e = Efficiency = 1.0

Using data contained in the Oregon State University's Water Resources Research Institute's 1979 study entitled "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon" and other appropriate data, the theoretical hydroelectric power potential for this segment of the North Fork Coquille River would be:

$$P = (0.08475)\ (219)\ (115)\ (1.0) = 2134.4287 \text{ kilowatts}$$

There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment.

D. Effects on Outstandingly Remarkable Values

1. ORVs That Would be Enhanced if River Segment Were Designated

Designation would ensure the protection of riparian habitat on BLM-administered lands. Designation would enhance wildlife populations by helping to preserve their existing habitat.

Bald eagle habitat and nesting would continue to be protected by the Endangered Species Act, and management of riparian areas would provide appropriate protection of fisheries habitat. Cultural values would be protected by the Archaeological Resources Protection Act (ARPA).

2. ORVs That Would be Diminished if River Segment Were not Designated

Private timber lands would continue to be harvested without giving consideration to recreational values on the river. Riparian zones would be afforded some protection under the State Forest Practices Act. BLM-administered portions of the river corridor would be protected as an HCA, ACEC, OGEA, and/or RMA, even if not designated as a recreational river. Some slight damage to ORVs could occur through timber harvest planned in the next decade, but the ORVs would be maintained.

E. How the River Segment Would be Managed if Not Designated

If the river were not added to the NWSRS, its level of public visibility would not be increased and management would continue for existing levels of recreational use. Riparian, fisheries, and watershed values would continue to be protected. A portion of the upper river corridor would be afforded additional protection through ACEC designation. Timber harvest could occur outside riparian zones subject to inventoried VRM classes quidelines. Scenic attributes of the river viewshed may be diminished.

If the river were added to the NWSRS as recreational, management would be similar to that if it were not designated. Increased public use due to its higher visibility could require more management of recreational use.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing condition. If a land use or development were to clearly threaten the ORVs which resulted in the river's designation, efforts would be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation were necessary, the only landowner rights subject to purchase would be those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORVs, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, the estimated costs of acquiring necessary lands or interests in lands will be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward stating a willingness to share in the cost of administering this river segment should it become part of the system. It is unlikely, considering the financial constraints imposed by Oregon ballot "Measure 5", that any state or local government agencies would share in these costs.

G. Administering Agency

If the North Fork Coquille River were added to the NWSRS, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 42-mile segment of the North Fork Coquille River from the headwaters in T. 26 S., R. 10 W., Sec. 16, Will. Mer., to the confluence with the South Fork Coquille River in T. 29 S., R. 12 W., Sec. 5, Will. Mer., is found nonsuitable for federal designation as a recreational river under the Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System

The low comparative rating of the river's two ORVs makes it a marginal potential addition to the National Wild and Scenic Rivers System. The cultural and fish/wildlife ORVs are both fairly typical for rivers in the region. BLM's intent in the preferred alternative of this Draft RMP/EIS to protect those ORVs on BLM-administered land indicate that designation is not needed to protect those values. The ORVs are not threatened by dam construction nor irrigation development. On private land not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect the ORVs from impacts associated with timber management.

In addition, although county zoning permits additional development of private lands on the county road fronting the river, such development would probably effect those values only slightly. Local opposition to such designation, coupled with the lack of any major public support, reinforces the conclusion of nonsuitability. Considering the above factors, BLM believes the river segment's ORVs can best be protected by a combination of the actions set forth in the preferred alternative of this Draft RMP/EIS, and by management of private land consistent with county zoning and state law.

Appendix II-N-4

East Fork Coquille River

I. Summary

The 32.5-mile segment of the East Fork Coquille River from the headwaters in T. 28 S., R. 8 W., Sec. 18, Will. Mer. to the confluence with the North Fork Coquille River in T. 28 S., R. 12 W., Sec. 36, Will. Mer. is found non-suitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

The district identified as eligible a 32.5-mile segment of the East Fork Coquille River from the headwaters in T. 28 S., R. 8 W., Sec. 18, Will. Mer. to the confluence with the North Fork Coquille River in T. 28 S., R. 12 W., Sec. 36, Will. Mer. (See Map II-N-4.) Tributaries feeding into the river include Elk, Brummet, China, and Camas creeks.

Parts of the river corridor (0.25 mile each side of the river) have been clearcut while other parts have Douglas-fir and alder forests. The lower portion of the corridor is bounded by agricultural land, and several residences are located within the corridor. County roads, including the Coos Bay Wagon Road, parallel the river for the entire length of the segment, helping to provide public access.

Frona County Park is located near the midsection of the river. Several popular swimming holes attract local residents to the area. Both bank and driftboat fishing opportunities attract an increasing number of local and regional visitors. Kayak activity is also popular in the upper portion of the segment during periods of safe and adequate flows.

The East Fork Coquille River has good water quality that is typical for this area. Monitoring of tributary streams in the watershed shows that state DEQ water quality standards are usually met. Forest management activities in the East Fork Coquille drainage are about equal to the monitored streams and therefore water quality is expected to be good. The East Fork Coquille River had flows slightly higher than normal for this region.

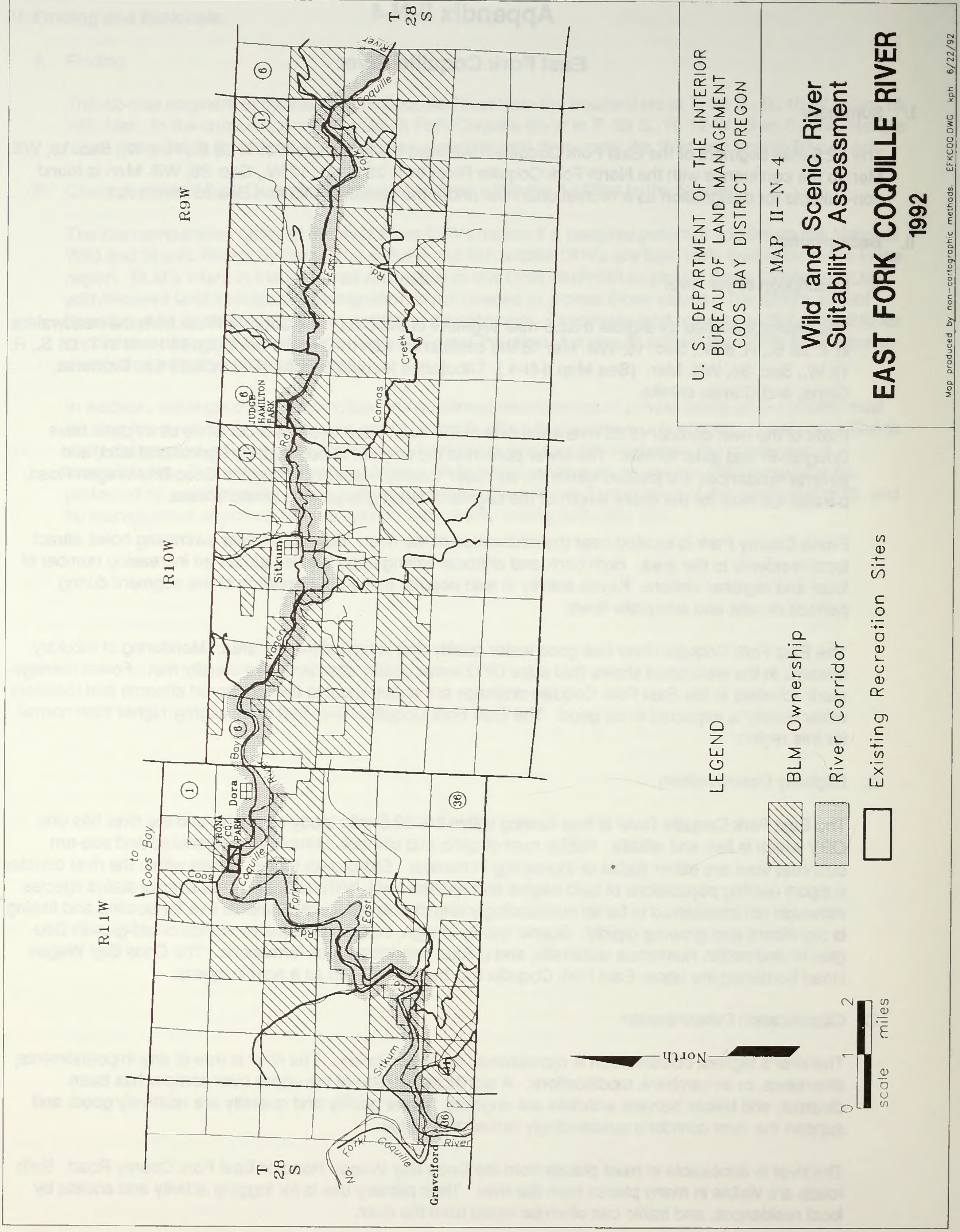
B. Eligibility Determination

The East Fork Coquille River is free-flowing within the 32.5-mile study segment, and the river has one ORV which is fish and wildlife. Native runs of coho and chinook salmon, and steelhead and sea-run cutthroat trout are either stable or increasing in number. Old-growth timber stands within the river corridor support nesting populations of bald eagles and spotted owls, both federally listed special status species. Although not considered to be an outstandingly remarkable value, recreational use for boating and fishing is significant and growing rapidly. Scenic quality is high, including extensive stands of old-growth Douglas-fir and cedar, numerous waterfalls, and unique sandstone rock formations. The Coos Bay Wagon Road bordering the upper East Fork Coquille has been proposed as a scenic byway.

C. Classification Determination

The river's highest classification is recreational, as shown below. The river is free of any impoundments, diversions, or streambank modifications. A significant portion of the upper river corridor has been clearcut, and timber harvest activities are ongoing. Water quality and quantity are relatively good, and support the river corridor's outstandingly remarkable value.

The river is accessible in most places from the Coos Bay Wagon Road or East Fork County Road. Both roads are visible in many places from the river. Their primary use is for logging activity and access by local residences, and traffic can often be heard from the river.


U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
COOS BAY DISTRICT OREGON
MAP II-N-4
Wild and Scenic River
Suitability Assessment
EAST FORK COQUILLE RIVER
1992
Map produced by non-cartographic methods. EFKCOQ.DWG kph 6/22/92
LEGEND
BLM Ownership
River Corridor
Existing Recreation Sites
North
scale miles
0
1
2
R11W
R10W
R9W
T 28 S
T 28 S
to Coos Bay
Coos Bay Wagon Rd
FRONA CO. PARK
Dora
Sitkum
JUDGE HAMILTON PARK
Camas Creek
East Fork Coquille River
Sitkum
Gravelford
North Fork Coquille River
1
6
8
1
8
1
6
36
36

Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	DM	M
Water Quality	DM	M	M
Accessibility	DM	DM	M

M = Meets
DM = Does Not Meet

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The district administers 15 stream-frontage miles (both sides included) which is approximately 23 percent of the river segment. Ownership over the total river corridor is shown below.

East Fork Coquille River Segment Ownership and Status
Within the River Corridor

Ownership	Acres	Percent
BLM		
Public Domain	20	.2
O&C Lands	140	1.4
CBWR	3,140	31.2
Forest Service	0	0
State	0	0
County	160	1.6
Georgia-Pacific Timber Co./ Other Private	6,590	65.6
Total	10,050	100.0

2. Land Use

Current land uses within the 0.5-mile wide river corridor are varied. Harvesting of timber stands on private lands continues with 20 percent clearcut in the last five years. Private land clearcuts have varied from 20 acres to over 200 acres. Timber harvesting on public lands has been limited, with ten sales in the last ten years. Silviculture practices on public land include stand maintenance and pre-commercial thinning, with individual harvest units ranging from 20 to 60 acres. Livestock grazing and agricultural activities occur on private lands within the river corridor.

Residential development on private land within the river corridor includes 20 family residences, 12 of which involve attendant river frontage improvements (i.e., landscaping). There are also 15 undeveloped lots zoned for residential development. Private residential lots range in size from less than one acre to five acres.

There are currently no known mining claims located within the river corridor, and no federal mineral leases are in effect. A powerline right-of-way (115-kV)) crosses the river nine times between Dora and the headwaters.

B. Reasonable Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of Appendix II-N.

1. Uses That Would be Enhanced by Designation

If the river were designated as recreational, BLM management would be similar in most respects to management without designation. With designation, however, BLM's management presence would increase in proportion to increased river use. The result would be diminished inappropriate uses and enhancement of the river segment's recreational use.

2. Uses That Would be Foreclosed by Designation

Designation as recreational could foreclose some development options resulting in county zoning restrictions on currently subdivided but undeveloped lands, or to federal efforts to acquire scenic easements to limit development on such lands.

3. Uses That Would be Curtailed by Designation

Designation as recreational would lead to application of a higher water quality standard, requiring more consideration to timing of BLM timber sales in the upstream watershed which could also diminish the rate of timber harvest.

C. Hydroelectric and Other Water Diversion Potential

The potential hydroelectric power available in any stream reach is determined by the formula $P=cQHe$, where:

P = Power (kilowatts)
c = Conversion factor = 0.08475
Q = Streamflow (ft^3/sec)
H = Head (feet)
e = Efficiency = 1.0

Using data contained in the Oregon State University's Water Resources Research Institute's 1979 study entitled "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon" and other appropriate data, the theoretical hydroelectric power potential for this segment of the East Fork Coquille River would be:

$$P = (0.08475)\ (180)\ (66)\ (1.0) = 1006.83 \text{ kilowatts}$$

There is no Federal Energy Regulatory Commission (FERC) application, irrigation, nor other proposals for dams or diversions on file for this river segment.

D. Effects on Outstandingly Remarkable Values

1. ORVs That Would be Enhanced if River Segment Were Designated

Designation would ensure the protection of riparian habitat on BLM-administered lands. Designation would enhance wildlife populations by helping to preserve their existing habitat.

Bald eagle habitat and nesting would continue to be protected by the Endangered Species Act, and management of riparian areas would provide appropriate protection of fish habitat.

2. ORVs That Would be Diminished if River Segment Were not Designated
Private timber lands would continue to be harvested without giving consideration to recreational values on the river. Riparian zones would be afforded some protection under the Oregon Forest Practices Act.

E. How the River Segment Would be Managed if Not Designated

If the river were not added to the NWSRS, its level of public visibility would not be increased and management would continue for existing levels of recreational use. Riparian, fisheries, and watershed values would continue to be protected. Timber harvest could occur outside riparian zones subject to inventoried VRM classes guidelines. Scenic attributes of the river viewshed may be diminished.

Designation of the Coos Bay Wagon Road bordering the East Fork Coquille as a scenic byway could increase recreational use.

If the river were added to the NWSRS as recreational, management would be similar to that if it were not designated. Increased public use due to its higher visibility could require more management of recreational use.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing condition. If a land use or development were to clearly threaten the ORVs which resulted in the rivers' designation, efforts will be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation were necessary, the only landowner rights subject to purchase would be those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORVs, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, the estimated costs of acquiring necessary lands or interests in lands would be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward stating a willingness to share in the cost of administering this river segment should it become part of the system. It is unlikely, considering the financial constraints imposed by Oregon ballot "Measure 5", that any state or local government agencies would share in these costs.

G. Administering Agency

If the East Fork Coquille were added to the NWSRS, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 32.5 mile-segment of the East Fork Coquille River from its headwaters in T. 28 S., R. 8 W., Sec. 18, Will. Mer., to its confluence with the North Fork Coquille River in T. 28 S., R. 12 W., Sec. 36, Will. Mer., is found nonsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System.

The low comparative rating of the river's ORV makes it a marginal potential addition to the NWSRS. The fish and wildlife ORV is typical of rivers in the region. BLM's intent in the preferred alternative of this Draft RMP/EIS to protect this ORV on BLM-administered land indicates that designation is not needed to protect this value. The ORV is not threatened by dam construction nor irrigation development. On private land not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect the ORV from impacts associated with timber management.

In addition, although county zoning permits additional development of private lands on the county road fronting the river, such development would probably effect those values only slightly. Local opposition to recreational designation, coupled with the lack of any major public support, reinforces the conclusion of nonsuitability. Considering the above factors, BLM believes the river segment's ORV can best be protected by a combination of the actions set forth in the preferred alternative of this Draft RMP/EIS, and by management of private land consistent with county zoning and state law.

Appendix II-N-5

New River

I. Summary

The 9.5-mile segment of New River from the outlet of Floras Lake to its confluence with the Pacific Ocean north of Four Mile Creek is found non-suitable for designation as scenic under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

The Coos Bay District identified as eligible a 9.5-mile segment of New River from the outlet of Floras Lake in T. 31 S., R. 15 W., Sec. 8, to its confluence with the Pacific Ocean north of Four Mile Creek, in T. 29 S., R. 15 W., Sec. 35. (See Map II-N-5.) Tributaries to the river include New Lake, Croft Lake, Laurel Lake, Floras Creek and Four Mile Creek.

Portions of the river sometimes dry up during the summer. The mouth of the river is usually blocked by a sandbar during late summer and fall, backing water up as far as New Lake.

Most of the 0.5-mile river corridor (0.25 mile on each side of the river) is in an essentially natural condition. Some lands near the southern end of New River have been partially modified by farming activities, including fence construction, plowing and disking, and ditching and draining of wetlands. Several houses have recently been built along the east bank of New River, near its northern outlet to the ocean. Lower Four Mile County road parallels the northern end of the river for one mile, providing limited public access. An unimproved road through the Storm Ranch (recently acquired by the BLM) allows public access to the northern portion of New River.

The New River area attracts regional users (users more than 25 miles away) as well as local residents. The river offers opportunities for both bank and drift boat fishing. Canoeing is popular in the river's upper portion during periods of adequate flow. Windsurfing is a popular recreational activity on Floras Lake.

New River has good water quality which is sufficient to support the river's ORVs. Water quality for recreational use of rivers is not required to continually meet or exceed federally-approved state standards. Therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System.

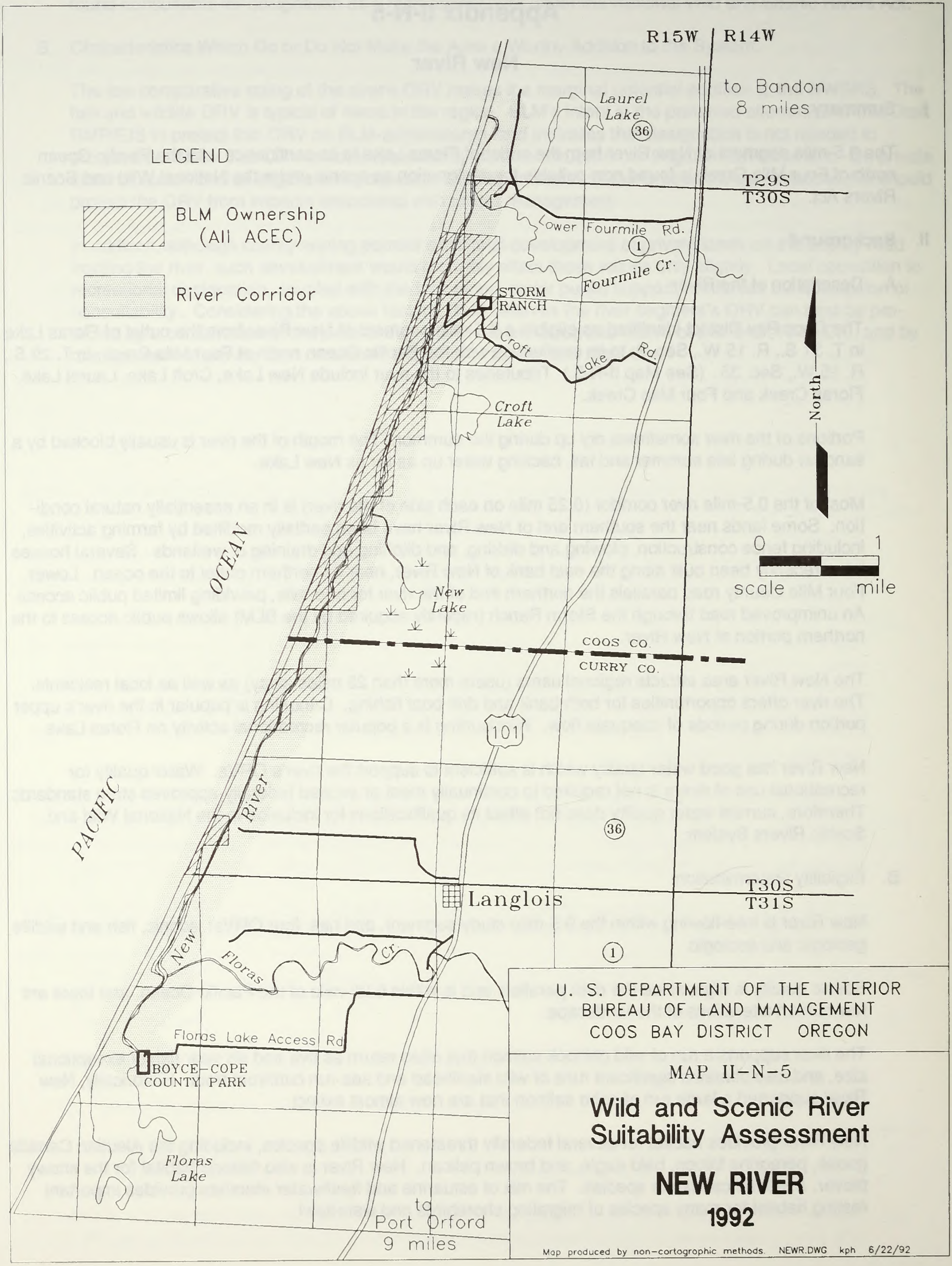
B. Eligibility Determination

New River is free-flowing within the 9.5-mile study segment, and has four ORVs: scenic, fish and wildlife, geologic and ecologic.

Scenic quality is high, since the river parallels and is within 0.25-mile of the Pacific Ocean, and there are few human alterations of the landscape.

The river supports a run of wild chinook salmon that often return as five and six year fish of exceptional size, and also contains significant runs of wild steelhead and sea-run cutthroat trout. Historically, New River supported a large run of coho salmon that are now almost extinct.

New River provides habitat for several federally threatened wildlife species, including the Aleutian Canada goose, peregrine falcon, bald eagle, and brown pelican. New River is also historic habitat for the snowy plover, a federal candidate species. The mix of estuarine and freshwater marshes provides important resting habitat for many species of migrating shorebirds and waterfowl.



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COOS BAY DISTRICT OREGON

MAP II-N-5

Wild and Scenic River Suitability Assessment

NEW RIVER

1992

Map produced by non-cortographic methods. NEWR.DWG kph 6/22/92

Geologically, New River is remarkable in that unlike other rivers in the region which are confined to a rock channel, it is confined only by a sand substrate, resulting in almost yearly changes in the riverbed. New River's ecologic uniqueness is its diversity of habitats, including ocean beach, foredune, estuaries, and fresh-water lakes.

New River has other important values in addition to the above ORVs. It has a diversity of recreational activities which are listed in several national publications. These include bird watching, hiking, fishing, waterfowl hunting, and boating.

Culturally, New River is important since several major Native American village sites are known to exist along the river.

This suitability assessment was based upon the findings above and the fact that BLM administers 50 percent of the area along the 9.5-mile river corridor.

C. Classification Determination

The river's highest potential classification is scenic, as shown below. The river is free of any impoundments, diversions, or streambank modifications. Late summer winds sometimes create a sand barrier across the stream mouth that is breached after the first heavy winter freshet. Shoreline development includes several dispersed residential dwellings and associated structures on adjacent private lands. Fences to control livestock movement are visible in several places. Water quality and quantity is relatively good, and supports the river corridor's outstandingly remarkable values.

The river is accessible in places by Four Mile County Road, which runs parallel to the river for approximately one mile, but does not cross the river. The road, located about 0.5 mile east of the river, is well-screened by vegetation and sand dunes. Primary uses of the road are for recreational activities and access to local residences. An unimproved road crosses the Storm Ranch and terminates on the east bank of New River near its midsection. An unimproved boat ramp is visible from the river.

New River Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	M	M
Water Quality	M	M	M
Accessibility	DM	M	M

M = Meets
DM = Does not Meet

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The district administers 9.5 stream-frontage miles (both sides included) which is 50 percent of the river segment. Ownership over the total river corridor is shown below. In addition, the state of Oregon manages a recreation easement that extends from the east bank of New River across the foredune to the Pacific Ocean along the entire length of the river.

New River Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent
BLM Public Domain	865	29.3
Forest Service	0	0
State	0	0
County	122	4.1
Private Individuals	1,965	66.6
Total	2,952	100.0

The BLM-administered land is primarily located along the edges of New River. Especially along the east bank, private ownership extends to within one-eighth mile of the river, explaining the discrepancy between ownership of frontage miles (50%) and total acreage (29.3%). The BLM is currently attempting to acquire additional lands along New River from willing sellers.

2. Land Use

Land uses within the 0.5-mile river corridor are varied. Most private lands along the river are used for grazing sheep and cattle, and some of the marshes are mowed for hay each summer.

Private land developments within the river corridor include five residences, none of which have attendant river frontage improvements. There are ten undeveloped lots zoned for future residential development. Private residential lots range in size from less than one acre to five acres.

There are no known mining claims located within the river corridor, no federal mineral leases are in effect, and BLM-administered lands are withdrawn from mineral entry. An unimproved boat ramp is located south of Four Mile Creek on the Storm Ranch. A county-maintained boat ramp is located at Boice-Cope Park at the south end of the river segment under consideration.

Curry County has zoned the river corridor within their jurisdiction as Conservation Shoreland or Forest/Farm, which provides some protection to the streambank and limits building lots to a 20-acre minimum. At the northern end of New River, in Coos County, the east bank of the river has been subdivided into five-acre parcels and several houses have recently been constructed in the Roaring Surf Subdivision.

B. Reasonably Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of Appendix II-N.

1. Uses That Would be Enhanced by Designation

The BLM-administered lands at New River are presently managed as an Area of Critical Environmental Concern. As such, the significant resource values are already afforded a high degree of protection. However, it is conceivable that scenic designation would result in a greater BLM management presence, diminishing inappropriate uses and enhancing the river segment's recreational use. It is also possible that the application of higher water quality standards would result in greater streamflows during dry seasons of the year. Designation as scenic would lead to VRM-II management of BLM-administered land in the 0.5-mile river corridor which would directly enhance its scenic and wildlife habitat values and indirectly, its recreational value.

2. Uses That Would be Foreclosed by Designation

Designation as scenic could result in county zoning restrictions on currently subdivided but undeveloped lands, or to federal efforts to acquire scenic easements limiting development on such lands.

3. Uses That Would be Curtailed by Designation

Scenic designation would curtail such activities as riprapping, driving of pilings, or using car bodies to control streambank erosion. Restrictions could be placed upon the dredging of adjacent waterways that encourages runoff from agricultural lands and upon the breaching of the foredune near the outlet of Floras Lake. Construction of fences in or adjacent to the river might be restricted. Intensive recreational development on BLM lands could be limited by this designation.

C. Hydroelectric and Other Water Diversion Potential

New River is not considered to have any hydroelectric potential.

D. Effects on Outstandingly Remarkable Values

1. ORVs That Would be Enhanced if River Segment were Designated

Designation would enhance wildlife and fish populations by helping to preserve existing habitat. Aleutian Canada goose, peregrine falcon, bald eagle and snowy plover habitat would continue to be protected by the Endangered Species Act, and management of riparian areas would provide appropriate protection for fish habitat.

2. ORVs That Would be Diminished if River Segment Were not Designated

As previously noted, BLM-administered lands along New River are already afforded a high degree of protection through ACEC designation. Overall, fish and wildlife habitat along New River would be subject to slightly lower standards of management if designation does not occur. Riparian values on private land could conceivably be damaged through overgrazing, riprapping, and dredging. Damage to the fragile ecology of New River could occur through artificial breaching of the foredune, or attempts to stabilize the foredune with structures or planting of exotic species. Summer stream flows could continue to diminish due to increased removal of water for irrigation of adjacent agricultural lands.

E. How the River Segment Would be Managed if Not Designated or if Designated at a Lower Classification

If the river were not added to the National Wild and Scenic Rivers System, BLM would continue to manage land under its jurisdiction within the 0.5-mile corridor as an ACEC, providing for substantial protection of the riparian values and continuation of existing levels of use within the corridor.

Additional development of subdivided private lands could diminish the scenic attributes, as well as riparian values. Cumulatively, such actions would possibly degrade the river's eligibility classification to recreational but not alter the ORVs.

If the river were added to the NWSRS, but designated as recreational, management would be similar to nondesignation. Designation would increase public use due to its higher visibility and could result in the need for more management of recreational use.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing values. If a land use or development were to clearly threaten the ORVs which resulted in the river's designation, efforts would be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation were necessary, the only landowner rights subject to purchase would be those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORVs, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, the estimated costs of acquiring necessary lands or interests in lands will be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment is $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward stating a willingness to share in the cost of administering this river segment should it become part of the NWSRS. It is unlikely considering the financial constraints imposed by Oregon Ballot "Measure 5," that state or local agencies would share in these costs. Also there is no local governmental support for designation of New River.

G. Administering Agency

If New River were added to the NWSRS, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 9.5-mile segment of New River from the outlet of Floras Lake to the confluence with the Pacific Ocean north of Four Mile Creek is found non-suitable for federal designation as a scenic river under the Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System

The two main factors that would make New River a meaningful addition to the NWSRS are the high percentage (50 percent) majority of federal, state, and county jurisdiction within 0.5-mile corridor of this segment and the relative high ranking of the four ORVs. Values that are either comparable to, or more significant than those on other designated rivers in the NWSRS are described as follows:

- The scenic value of New River is high. The river parallels the ocean for over nine miles, and the beaches and foredune west of New River are in essentially natural condition. The mix of landscapes, including the ocean beach, river corridor, freshwater marshes, and foothills of the Siskiyou Mountains enhance its scenic qualities.

- Fish and wildlife values rank New River among the best rivers in southwest Oregon. New River has native runs of chinook salmon consisting of primarily five and six-year-old returning fish, and healthy runs of sea-run cutthroat trout and steelhead. Habitat at New River is utilized by several special status wildlife species, including the Aleutian Canada goose, bald eagle, peregrine falcon, brown pelican and snowy plover. Many species of shorebirds and waterfowl use New River for critical resting habitat during their annual spring and fall migrations.

- New River is one of the youngest rivers in North America, and one of the most unstable. In the early stages of successional development, it continues to expand in length and periodically changes channels. As such, it is geologically unique among rivers on the south coast.

- New River is the only stream in southwest Oregon that runs parallel to and adjacent to the Pacific Ocean for over nine miles, and continues to increase in length yearly.

- A diversity of habitats (i.e., ocean beach, foredune, estuary, freshwater sloughs and marshes, and freshwater lakes) are represented at New River, making the area ecologically unique. Even though many of these habitats have evolved naturally within the last 50 years, their condition is better than most other similar habitats in the region.

Local support for designation, however, is almost totally lacking. Adjacent landowners are very hostile towards designation, fearing future restrictions on land uses or possible condemnation.

Management of BLM-administered portions of New River as an ACEC provides protection for all identified ORVs. Attempts are underway to acquire additional lands along New River from willing sellers, increasing the opportunities for enhancement of the ORVs.

Designation as scenic would not provide for any increased level of protection for the river corridor. It could also strain relationships with adjacent landowners, possibly precluding opportunities for acquisition, conservation easements, and other cooperative efforts.

Appendix II-N-6

South Fork Pistol River

I. Summary

The 12-mile segment from the headwaters of the South Fork Pistol River in T. 39 S., R. 13 W., Sec. 11, Will. Mer. to the confluence with Pistol River in T. 38 S., R. 13 W., Sec. 19, Will. Mer. is found nonsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

The district identified as eligible a 12-mile segment of the South Fork Pistol River from the headwaters in T. 39 S., R. 13 W., Sec. 11, Will. Mer. to the confluence with Pistol River in T. 38 S., R. 13 W., Sec. 19, Will. Mer. (See Map II-N-6.) Tributaries feeding the river include Farmer Creek, Scott Creek, Bull Gulch, and Koontz and Davis Creeks.

Much of the river corridor (0.25 mile on each side of the river) has been clearcut, while other parts have Douglas-fir and tanoak forests. The lower three miles of the South Fork is bordered by the South Coast Lumber Company's 7000 road, the upper three miles is bordered by BLM's 39-13-18.0 road, and the middle six miles are essentially unroaded.

Recreational use of the South Fork Pistol River is extremely limited, since none of the bordering roads are open to the public. Some local residents may occasionally use the river for fishing during the summer.

The South Fork Pistol River has good water quality that is typical for this area. Monitoring of other adjacent tributary streams in the watershed shows that state DEQ water quality standards are usually met. Forest management activities in the South Fork Pistol drainage are less than on the monitored streams and therefore water quality is expected to be good. The South Fork Pistol River has had flows slightly higher than normal for this region. Water quality and watershed conditions are further discussed in the Water Resources Section of the District RMP/EIS.

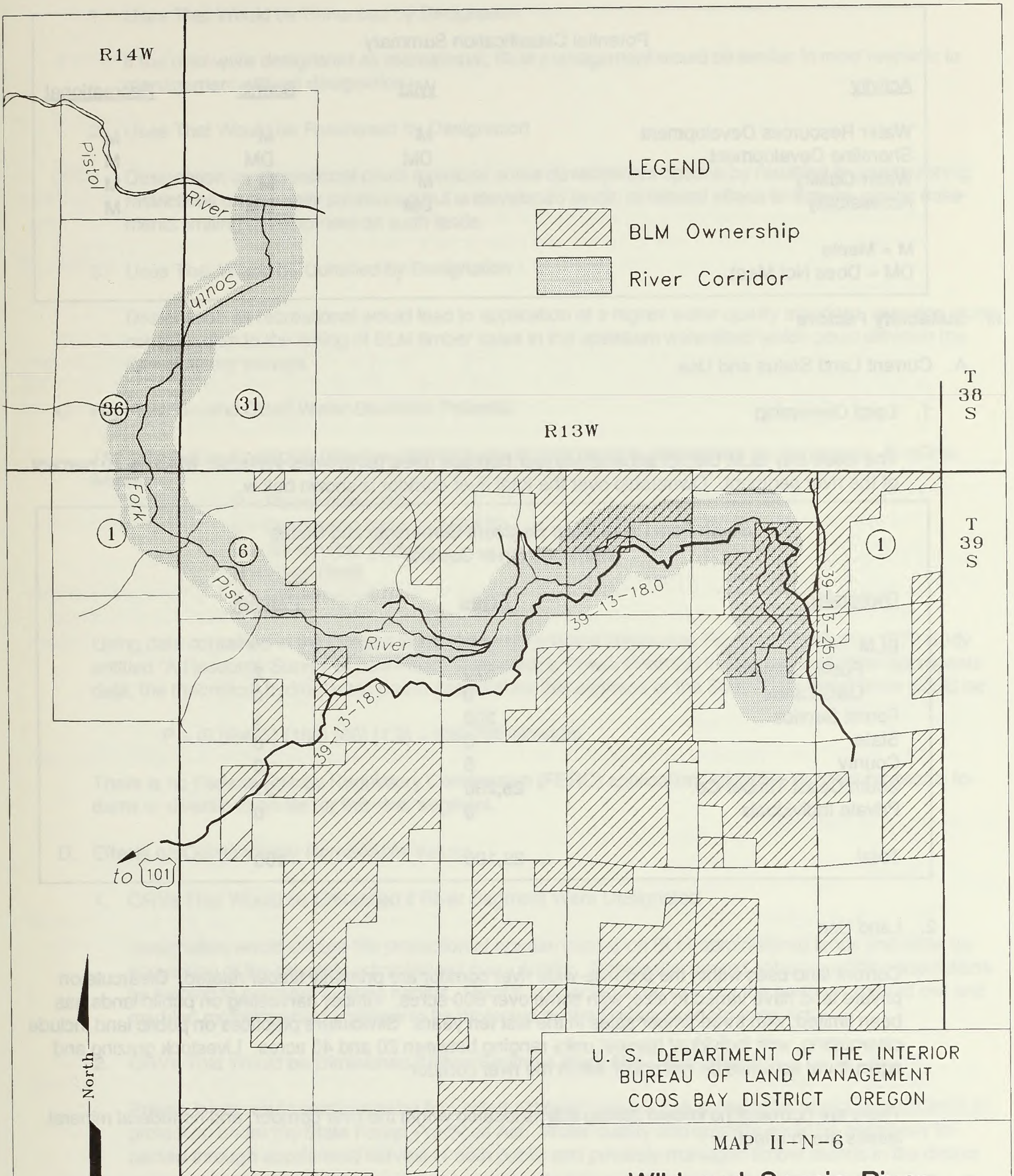
B. Eligibility Determination

The South Fork Pistol River is free-flowing within the 12-mile study segment. The river has one ORV, fish and wildlife. Both steelhead trout and sea-run cutthroat trout utilize the South Fork for spawning and rearing habitat. The marbled murrelet and northern spotted owl, federally listed or proposed for listing special status species, may use the river corridor for nesting habitat. Portions of the hardwood-dominated riparian zone along the river are in essentially pristine condition.

C. Classification Determination

The river's highest classification is recreational, as shown below. The river is free of any impoundments, diversions, or streambank modifications. Much of the river corridor and surrounding environment has been clearcut and harvest activities are ongoing. Water quality and quantity is relatively good, and supports the river corridor's outstandingly remarkable fisheries values.

The river is accessible along the lower three miles by South Coast Lumber Company's 7000 road, and by BLM's 39-13-18.0 road along the upper three miles. Both roads are visible in many places from the river. Primary use of these roads is for logging activity, and traffic can often be heard from the river.



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MAP II-N-6

Wild and Scenic River Suitability Assessment

SOUTH FORK PISTOL RIVER

1992

Map produced by non-cartographic methods. SFPIS.DWG kph 6/22/92

Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	DM	M
Water Quality	M	M	M
Accessibility	DM	DM	M

M = Meets
DM = Does Not Meet

III. Suitability Factors

A. Current Land Status and Use

1. Land Ownership

The Coos Bay BLM District administers four frontage miles (both sides included) which is 20 percent of the river segment. Ownership over the total river corridor is shown below.

South Fork Pistol River Segment Ownership and Status
Within the River Corridor

Ownership	Acres	Percent
BLM		
Public Domain	570	2
O&C Lands	0	0
Forest Service	300	1
State	0	0
County	0	0
South Coast Timber Co.	28,230	97
Private Individuals	0	0
Total	29,100	100

2. Land Use

Current land uses within the 0.5-mile-wide river corridor are primarily timber related. Clearcuts on private land have varied in size, with some over 600 acres. Timber harvesting on public lands has been limited, with three timber sales in the last ten years. Silviculture practices on public land include clearcutting, with individual harvest units ranging between 20 and 40 acres. Livestock grazing and agricultural activities do not occur within the river corridor.

There are currently no known mining claims located within the river corridor, and no federal mineral leases are in effect.

B. Reasonable Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of Appendix II-N.

1. Uses That Would be Enhanced by Designation

If the river were designated as recreational, BLM management would be similar in most respects to management without designation.

2. Uses That Would be Foreclosed by Designation

Designation as recreational could foreclose some development options by resulting in county zoning restrictions on currently subdivided but undeveloped lands, or federal efforts to acquire scenic easements limiting development on such lands.

3. Uses That Would be Curtailed by Designation

Designation as recreational would lead to application of a higher water quality standard, requiring more consideration to the timing of BLM timber sales in the upstream watershed which could diminish the rate of timber harvest.

C. Hydroelectric and Other Water Diversion Potential

The potential hydroelectric power available in any stream reach is determined by the formula $P+cQHe$ where:

P = Power (kilowatts)
c = Conversion factor = 0.08475
Q = Streamflow (ft^3/sec)
H = Head (feet)
e = Efficiency = 1.0

Using data contained in the Oregon State University's Water Resources Research Institute's 1979 study entitled "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon" and other appropriate data, the theoretical hydroelectric power potential for this segment of the South Fork Pistol River would be:

$$P = (0.08475)\ (168)\ (66)\ (1.0) = 939.708 \text{ kilowatts}$$

There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment.

D. Effects on Outstandingly Remarkable Values

1. ORVs That Would be Enhanced if River Segment Were Designated

Designation would ensure the protection of riparian habitat on BLM-administered lands and allow for acquisition of the privately-administered river corridor. Designation would enhance wildlife populations by helping to preserve existing habitat. Habitat suspected to be used by the northern spotted owl and marbled murrelet would continue to be protected by the Endangered Species Act.

2. ORVs That Would be Diminished if River Segment Were Not Designated

Private lands would continue to be harvested although riparian zones would be afforded some level of protection under the State Forest Practices Act. Water quality and quantity could be negatively impacted through accelerated harvest of both public and privately-managed timber stands in the district.

E. How the River Segment Would be Managed if Not Designated

If the river were not added to the NWSRS, the BLM would manage land under its jurisdiction within the 0.5-mile corridor for substantial protection of the riparian values and for continuation of existing levels of use within the corridor. The fish and wildlife ORV would be protected by such management. Lands in the 0.5-mile corridor, but outside the riparian zone would be subject to timber harvest and would be managed under the inventoried VRM class. This could diminish the scenic attributes of the river corridor.

If the river were added to the system as recreational, management would be similar to that if it were not designated.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing condition. If a land use or development clearly threatens the ORVs which resulted in the river's designation, efforts will be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation is necessary, the only landowner rights subject to purchase would be those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORVs, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, estimated costs of acquiring necessary lands or interests in lands will be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward and stated they would be willing to share in the cost of administering this river segment should it become part of the system. It is also unlikely, considering the financial constraints imposed by Oregon Ballot "Measure 5," that any state or local government agency would share in these costs.

G. Administering Agency

If the South Fork Pistol River were added to the NWSRS, the BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 12-mile segment of the South Fork Pistol River from its headwaters to confluence with the mainstem of Pistol River is found nonsuitable for federal designation as a recreational river under the Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System

The low comparative rating of the river's ORV makes it a marginal potential addition to the National Wild and Scenic Rivers System. The fish and wildlife ORV is typical of most other streams in SCORP Region 6. BLM's intent in the preferred alternative of this Draft RMP/EIS to protect this ORV on BLM-administered lands indicates that designation is not needed to protect this value. The ORV is not threatened by dam construction nor irrigation development. On private lands not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect this ORV from impacts associated with timber management. The low percentage of federal ownership in the corridor, coupled with local opposition to such designation, reinforces the conclusion of nonsuitability. Considering the above factors, BLM believes the river segment's ORV can best be protected by a combination of the actions set forth in the preferred alternative of this Draft RMP/EIS and by management of private land consistent with county zoning and state laws.

Appendix II-N-7

North Fork Chetco River

I. Summary

The 11-mile segment from the headwaters of the North Fork Chetco in T. 39 S., R. 14 W., Sec. 24, Will. Mer. to the confluence with the Chetco River in T. 40 S., R. 13 W., Sec. 35, Will. Mer. is found nonsuitable for designation as a recreational river under the National Wild and Scenic Rivers Act.

II. Background

A. Description of the River

The district identified as eligible an 11-mile segment of the North Fork Chetco River from its headwaters in T. 39 S., R. 14 W., Sec. 24, Will. Mer. to its confluence with the mainstem of the Chetco River in T. 40 S., R. 13 W., Sec. 35, Will. Mer. (See Map II-N-7.) Tributaries feeding into the river include Bravo, Jim Hunt, and Mayfield Creeks.

Most of the 0.5-mile river corridor (0.25 mile on each side of the river) has been clearcut. The lower three miles of the North Fork Chetco is bordered by the Lewis Creek private road, and the upper eight miles by a forest access road.

Recreational use of the North Fork Chetco is extremely limited, since none of the roads bordering it are open to the public. Some fishermen occasionally hike upstream from the confluence with the mainstem Chetco River.

The North Fork Chetco River has good water quality that is typical for this area. Monitoring of other adjacent tributary streams in the watershed shows that state DEQ water quality standards are usually met. Forest management activities in the North Fork Chetco drainage are less than on the monitored streams, so water quality is expected to be good. The North Fork Chetco River flows are slightly higher than normal for this region.

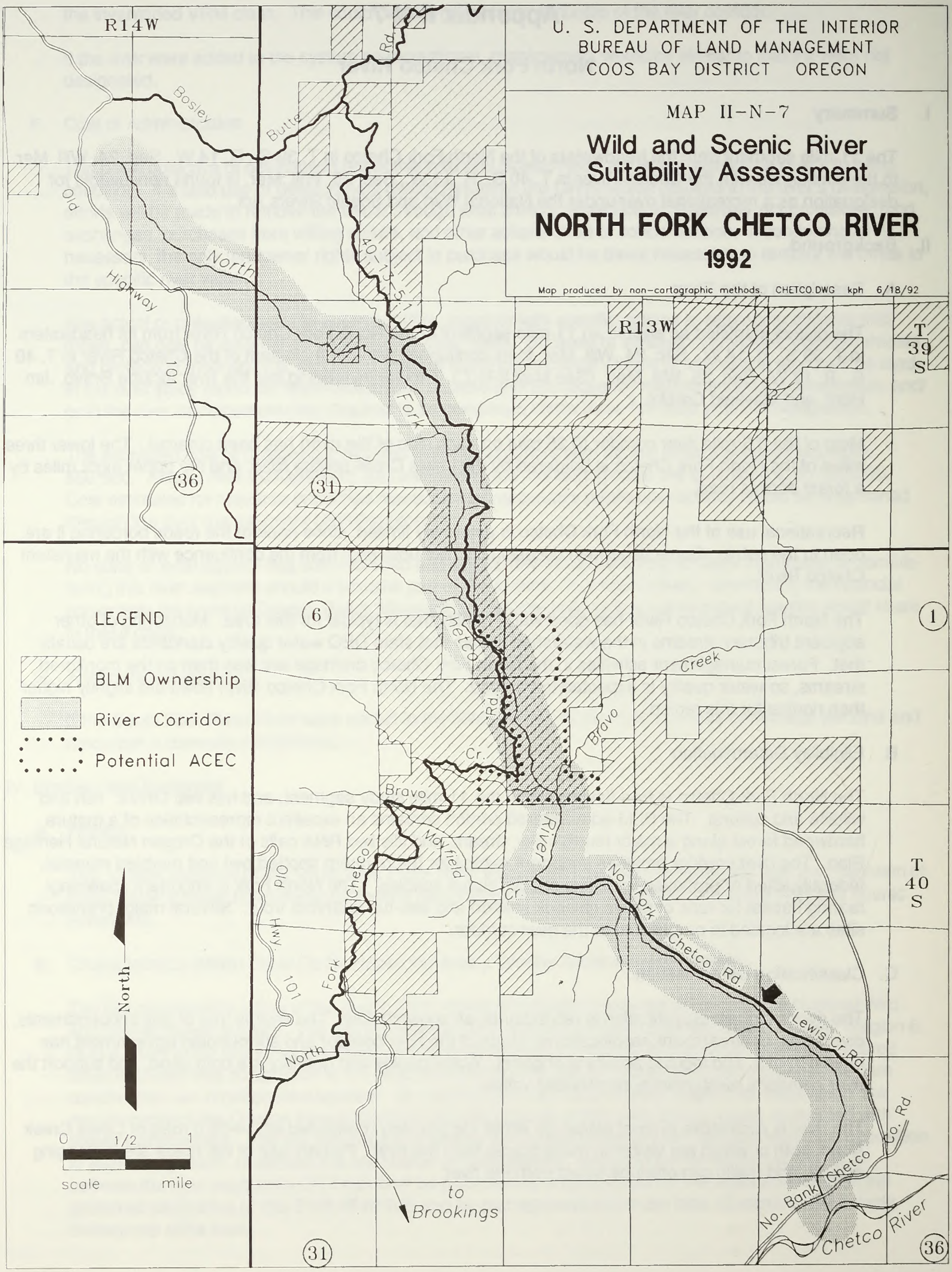
B. Eligibility Determination

The North Fork Chetco is free-flowing within the 11-mile study segment, and has two ORVs: fish and wildlife and cultural. The BLM-administered portion contains an excellent representation of a mature hardwood forest along a major fourth order stream, and fills two RNA cells of the Oregon Natural Heritage Plan. The river corridor provides important habitat for the northern spotted owl and marbled murrelet, federally listed or proposed for listing special status species. The North Fork is important spawning/ rearing habitat for runs of native chinook salmon and sea-run cutthroat trout. Several major prehistoric sites are located in or adjacent to the river corridor.

C. Classification Determination

The river's highest classification is recreational, as shown below. The river is free of any impoundments, diversions, or streambank modifications. Much of the river corridor and surrounding environment has been clearcut, and logging activity is ongoing. Water quality and quantity are both good, and support the river corridor's outstandingly remarkable values.

The river is accessible in most places by either the privately- controlled 40-14-25.0 road or Lewis Creek Road, both of which are visible in many places from the river. Primary use of the roads are for logging activity, and traffic can often be heard from the river.



U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
COOS BAY DISTRICT OREGON

MAP II-N-7

Wild and Scenic River
Suitability Assessment

NORTH FORK CHETCO RIVER
1992

Map produced by non-cartographic methods. CHETCO.DWG kph 6/18/92

LEGEND
- ▨ BLM Ownership
- ░ River Corridor
- ⋯ Potential ACEC

Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water Resources Development	M	M	M
Shoreline Development	DM	DM	M
Water Quality	M	M	M
Accessibility	DM	DM	M

M = Meets
DM = Does Not Meet

III. Suitability Factors

A. Current and Status and Use

1. Land Ownership

The district administers three frontage miles (both sides included) which is approximately 27 percent of the river segment. Ownership within the river corridor is shown below.

North Fork Chetco Segment Ownership and Status
Within the River Corridor

Ownership	Acres	Percent
BLM		
Public Domain	500	15
O&C Lands	0	0
Forest Service	0	0
State	0	0
County	0	0
South Coast Timber Co./ Other Private	2,800	85
Total	3,300	100

2. Land Use

Current land uses within the 0.5-mile wide river corridor are primarily timber related. Timber harvesting on private lands continues, with 50 percent clearcut in the last five years. Private land clearcuts have varied in size, from 40 acres to over 600 acres. Timber harvesting on public lands has been limited, with four timber sales in the last ten years. Silviculture practices on public land include stand maintenance and precommercial thinning, with individual harvest units ranging between 20 acres and 70 acres. Livestock grazing and agricultural activities do not occur within the river corridor.

Residential development on private land within the river corridor includes two family residences, neither of which involve attendant river frontage improvements (i.e., landscaping).

There are currently no known mining claims located within the river corridor, and no federal mineral leases are in effect. Curry County has zoned the river corridor for forest land use.

B. Reasonable Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix II-H of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic and recreational river areas. Consequences by plan alternative are displayed in Table II-N-3, which is located at the end of this Appendix II-N.

1. Uses That Would be Enhanced by Designation

   If the river were designated as recreational, BLM management would be similar in most respects to management without designation.

2. Uses That Would be Foreclosed by Designation

   Designation as recreational could foreclose some development options, by resulting in county zoning restrictions on currently subdivided but undeveloped lands, or federal efforts to acquire scenic easements limiting development on such lands.

3. Uses That Would be Curtailed by Designation

   Designation as recreational would lead to application of a higher water quality standard, requiring more consideration to the timing of BLM timber sales in the upstream watershed which could diminish the rate of timber harvest.

C. Hydroelectric and Other Water Diversion Potential

There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment.

The potential hydroelectric power of the North Fork Chetco River, is unknown. Since this river was not included in the 1979 OSU Hydroelectric Study, the formula used to determine potential kilowatts for other eligible rivers could not be applied.

D. Effects on Outstandingly Remarkable Values

1. ORVs That Would be Enhanced if River Segment Were Designated

   Designation would ensure the protection of riparian habitat on BLM-administered lands, and allow for acquisition of the privately-administered river corridor. Designation would enhance fish and wildlife populations by helping to preserve existing habitat. Northern spotted owl and marbled murrelet habitat would continue to be protected by the Endangered Species Act, and cultural values by the Archaeological Resources Protection Act.

2. ORVs That Would be Diminished if River Segment Were Not Designated

   Private lands would continue to be harvested, although riparian zones would be afforded some protection under the State Forest Practices Act. The future quality and quantity of fish and wildlife habitat could be negatively impacted through accelerated harvest of both public and privately-managed timber stands in the watershed.

E. How the River Segment Would be Managed if it Were Not Designated

If the river were not added to the NWSRS, the BLM would manage land under its jurisdiction within the 0.5-mile corridor for substantial protection of the riparian values and for continuation of existing levels of use within the corridor. The fish and wildlife and cultural ORVs would be protected by such management.

A portion of BLM-administered lands along the North Fork Chetco are recommended for designation as an Area of Critical Environmental Concern. Designation, if approved, would afford a high degree of protection for the ORVs.

If the river were added to the NWSRS as recreational, management would be similar to that if not designated.

F. Cost of Administration

The basic objective of designation under the Wild and Scenic River Act is to maintain the river's existing condition. Where a land use or development clearly threatens the ORVs which resulted in the river's designation, efforts would be made to remove the threat through local zoning, State Scenic Waterway Act provisions, land exchanges, purchases from willing sellers, and other actions short of condemnation. If condemnation is necessary, the only landowner rights subject to purchase are those necessary to remove the threat to the specific river value.

Any actual or potential threat to a river's ORVs, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values and possible threats and protection mechanisms, estimated costs of acquiring necessary lands or interests in lands would be made in the river study report for rivers determined suitable and subsequently recommended for designation, and/or in the river management plan required to be completed within three full fiscal years of designation. The estimated cost of preparing a required river management plan for this stream segment would be $50,000. Annual river management, administration, and monitoring costs are estimated to be $25,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward and stated they would be willing to share in the cost of administering this river segment should it become part of the system. It is also unlikely, considering the financial constraints imposed by Oregon Ballot "Measure 5," that any state or local government agency would share in these costs.

G. Administering Agency

If the North Fork Chetco were added to the NWSRS, BLM would continue to manage the land and resources it currently administers.

IV. Finding and Rationale

A. Finding

The 11-mile segment of the North Fork Chetco from its headwaters to confluence with the mainstem Chetco, is found nonsuitable for federal designation as a recreational river under the Wild and Scenic Rivers Act.

B. Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System.

The lack of significant federal ownership in the river corridor and low comparative rating of the river's two ORVs make it a marginal potential addition to the NWSRS. The fish and wildlife and cultural values of the river are not comparable to those of other rivers in SCORP Region 6 that are already designated. BLM's intent in the preferred alternative of this Draft RMP/EIS to protect the ORVs on BLM-administered lands indicate that designation is not needed to protect those values. The ORVs are not threatened by dam construction nor irrigation development. On private lands not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect the ORVs from impacts associated with timber management.

In addition, although county zoning permits additional development of private lands on the county road fronting the river, such development would probably effect those values only slightly. Local opposition to such designation, coupled with the lack of any major public support, reinforces the conclusion of nonsuitability. Considering the above factors, BLM believes the river segment's ORVs can best be protected by a combination of the actions set forth in the preferred alternative of this Draft RMP/EIS and management of private land consistent with county zoning and state law.

Table II-N-3. Determination of Condition Change by Alternative

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
Smith River	NA[1]	-Riparian management area: Mapped buffer protected, no planned commodity development. -Remainder of corridor: Available for community development.	Values only partially protected; some of corridor area available for commodity development, would result in loss of old-growth forest and habitat for old-growth dependent wildlife or possible reduction of water quality and spawning habitat for fish.
	A	-Riparian management area: 75' buffer protected; no planned commodity development. -Remainder of corridor: Available for commodity development.	Values only partially protected; 11% of corridor area available for commodity development would result in some visual impacts and loss of old-growth forest and habitat for old-growth dependent wildlife and possible reduction of fish habitat.
	B	-Riparian management area: 100' buffer protected; no planned commodity development. -Remainder of corridor: Available for commodity development.	Same as A above.
	C,D,E	-Riparian management area: 150'-200' buffer protected, depending on alternative; no planned commodity development. -Remainder of corridor: Values protected through various special habitat classifications.	All values protected.

Table II-N-3. Determination of Condition Change by Alternative (Continued)

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
Smith River (Cont.)	PA	-Riparian management area: 200' buffer protected, no planned commodity development. -Remainder of corridor: Available for commodity development.	Most values protected; only 4.5% of corridor area available for commodity development.
Wassen Creek	NA [1]	-Riparian management area: Mapped buffer protected, no planned commodity development. -Portion of corridor withdrawn to protect ecosystem diversity and fragile soils (TPCC). -Remainder ofcorridor: Available for commodity development.	Values only partially protected; some corridor area available for commodity development, would result in loss of mid-age forest and habitat for old-growth dependent wildlife, and possible reduction of water quality and spawning habitat for fish.
	A	-Riparian management area: 75' buffer protected, no planned commodity development. -Remainder of corridor: Available for commodity development.	Values only partially protected; 36% of corridor area available for commodity development would result in loss of mid-age forest and habitat for dependent wildlife and possible reduction of fish habitat.
	B	-Riparian management area: 100' buffer protected; no planned commodity development. -Portion of corridor included in retention block, no planned commodity development. -Remainder of corridor: Available for commodity development.	Most values protected; 17% of corridor area available for commodity development would result in loss of mid-age forest and habitat for dependent wildlife and possible reduction of fish habitat.
	C,D,E,PA	-Riparian management area: 150'-200' buffer protected, depending on alternative; no planned commodity development. -Portion of corridor designated as ACEC, values protected, no planned commodity development. -Remainder of corridor: Not available for harvest due to HCA and OGEA designation.	All values protected.

Table II-N-3. Determination of Condition Change by Alternative (Continued)

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
North Fork Coquille	NA[1]	-Riparian management area: Mapped buffer protected; no planned commodity development. -Remainder of corridor: Available for commodity development.	Values only partially protected; some corridor area available for commodity development, would result in loss of old-growth forest and habitat for old-growth dependent wildlife and possible reduction of water quality and spawning habitat for fish.
	A	-Riparian management area: 75' buffer protected; no planned commodity development. -Remainder of corridor: Available for commodity development.	Values only partially protected; 24% of corridor area available for commodity development would result in visual impacts, loss of old-growth forest and habitat for old-growth dependent wildlife, and some potential reduction of fish habitat.
	B	-Riparian management area: 100' buffer protected; no planned commodity development. - Remainder of corridor: Available for commodity development.	Values only partially protected; 23% of corridor area available for commodity development would result in visual impacts, loss of old-growth forest and habitat for old-growth dependent wildlife, and some potential reduction of fish habitat.
	C	-Riparian management area: 150' buffer protected; no planned commodity development. -Portion of corridor designated as retention block: Values protected, no planned commodity development. -Remainder of corridor: Available for commodity development.	Most values protected; 3% of corridor available for commodity development.

Table II-N-3. Determination of Condition Change by Alternative (Continued)

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
North Fork Coquille (Cont.)	D,E	-Riparian management area: 200' buffer protected; no planned commodity development. -Portion of corridor designated as ACEC: values protected, no planned commodity development. -Portion of corridor designated as HCA: Values protected, no planned commodity development. -Remainder of corridor: Available for commodity development.	Most values protected; 3% of corridor available for commodity development in Alt. D.
	PA	-Riparian Management Area: 200' buffer protected, no planned commodity development. -Remainder of corridor: Available for commodity development.	Most values protected; only 3.5% of corridor area available for commodity development.
East Fork Coquille	NA[1]	-Riparian management area: Mapped buffer protected; no planned commodity development. -Remainder of corridor: Available for commodity development.	Values only partially protected; some corridor result in visual impacts, loss of old-growth forest and habitat for old-growth dependent wildlife, and some potential reduction of fish habitat.
	A	-Riparian management area: 75' buffer protected; no planned commodity development. -Remainder of corridor: Available for commodity development.	Values only partially protected; 17% of corridor areas available for commodity development would result in visual impacts, loss of old-growth forest and habitat for old-growth dependent wildlife and some potential reduction of fish habitat.
	B	-Riparian management area: 100' buffer protected; no planned commodity development. - Remainder of corridor: Available for commodity development.	Values only partially protected; 12% of corridor area available for commodity development would result in visual impacts, loss of old-growth forest and habitat for old-growth dependent wildlife, and some potential reduction of fish habitat.

Table II-N-3. Determination of Condition Change by Alternative (Continued)

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
East Fork Coquille (Cont.)	C, D, E, PA	-Riparian management area: 150'-200' buffer protected depending on alternative; no planned commodity development. -Remainder of corridor: Available for commodity development.	Most values afforded some protection; only 2-4% of corridor area available for commodity development.
New River	NA, A, B, C, D, E, PA	-Riparian management area: Mapped buffer protected; no planned commodity development. Existing designated ACEC protected; no planned commodity development.	Values almost fully protected; may forgo some potential enhancement of riparian habitat development on private lands due to grazing and water diversion.
South Fork Pistol	NA [1]	-Riparian management area: Mapped buffer protected; no planned commodity development. - Remainder of corridor: Available for commodity development.	Values only partially protected; 10% of corridor area available for commodity development would result in loss of old-growth forest habitat for old-growth dependent wildlife, and some potential for reduction of fish habitat.
	A	-Riparian management area: 75' buffer protected; no planned commodity development. - Remainder of corridor: No planned commodity development for next decade.	All values protected.
	B	-Riparian management area: 100' buffer protected; no planned commodity development. - Remainder of corridor: No planned commodity development for next decade.	All values protected.

Table II-N-3. Determination of Condition Change by Alternative (Continued)

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
South Fork Pistol (Cont.)	C,D,E,PA	-Riparian management area: 150-200' buffer protected depending on alternative: No planned commodity development. - Remainder of corridor: No planned commodity development for next decade.	All values protected.
North Fork Chetco River	NA [1]	- Riparian management area: Mapped buffer protected; no planned commodity development. - Remainder of corridor: Available for commodity development.	Values only partially protected; Some corridor area available for commodity development would result in loss of old-growth forest and habitat for old-growth dependent wildlife and possible reduced water quality and spawning habitat for fish.
	A	- Riparian management area: 75 ' buffer protected; no planned commodity development. - Remainder of corridor: Available for commodity development.	Values only partly protected; 35% of corridor area available for commodity development would result in loss of old-growth forest and habitat for old-growth dependent wildlife and possible reduced water quality and spawning habitat for fish.
	B	- Riparian management area: 100' buffer protected; no planned commodity development. - Remainder of corridor: Available for commodity development.	Values only partly protected; 25% of corridor area available for commodity development would result in loss of old-growth forest and habitat for old-growth dependent wildlife and possible reduced water quality and spawning habitat for fish.

Table II-N-3. Determination of Condition Change by Alternative (Continued)

Study River	Alternative	Probable Resource Uses & Management Practices Within 0.25-mile Wide Corridor (0.25-mi. each side of study river from ordinary high water mark)	Major Consequence of Probable Resource Uses & Management Practices
North Fork Chetco River (Cont.)	C, D, E, PA	-Riparian management area: 150-200' buffer protected depending on alternative; no planned commodity development. - Portion of corridor designated as ACEC, values protected, no planned commodity development. - Remainder of corridor: Available for commodity development.	Most values protected through designation as ACEC.

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[1] Acreage figures not available for the NA Alternative.

Appendix II-O
Resource Management Plan Monitoring

Introduction

The BLM planning regulations (43 CFR 1610.4-9) call for monitoring and evaluating resource management plans at appropriate intervals. The purposes of monitoring and evaluating the RMP are to:

1) Track progress of RMP implementation and ensure that activities are occurring in conformance with the plan (Implementation Monitoring).

2) Determine if activities are producing the expected results and meeting stated objectives (Effectiveness Monitoring).

3) Determine if activities are causing the effects identified in the EIS (Validation).

Implementation of the Coos Bay District RMP will be monitored to ensure that management actions are being implemented and are meeting their intended purposes. Specific management actions arising from proposed activity plan decisions will be compared with RMP objectives to ensure consistency with the intent of the plan. Activity plan decisions may also, however, identify monitoring plans of their own. Such plans are addressed in this RMP monitoring plan only where RMP monitoring and activity plan monitoring overlap.

Some effectiveness monitoring and most validation can only be accomplished by formal research. RMP-related research is discussed in Chapter 2 of the RMP/EIS.

Monitoring will be conducted as specified in the following sections of this appendix. Monitoring results will be reported in an “Annual Program Summary,” to be published starting the second year following implementation of this RMP. The annual program summary will serve as a report to the public, track and assess the progress of plan implementation, and state the findings made through monitoring to determine if:

- Management actions are resulting in satisfactory progress toward achieving RMP objectives.
- Actions are consistent with current policy.
- Original assumptions are valid and impacts are within the range predicted, given the reliability of the predictions.
- Mitigation and corrective measures are satisfactory and serving their purposes.
- The RMP is still consistent with the plans and policies of State or local government, other Federal agencies, and Indian tribes.
- New data are available that could result in alteration or amendment of the plan.
- EPA requirements are being met.
- Compliance is being achieved on actions authorized by BLM.

Each resource area is responsible for the collection, compilation and analysis of much of the data gained through monitoring activities. Resource areas will report their findings and recommendations to the district for consolidation and publication in the “Annual Program Summary.”

Representative areas, such as a watershed monitoring area, may be selected and established. Intensive monitoring and data collection efforts for certain resources may be made in these areas in lieu of collecting general data over the entire geographic area, (often very expensive and provides less useful information).

Attempts would be made to select representative areas that have several resources/values.

All monitoring will follow written standards for the following, where relevant: sampling design, parameters to be monitored, analytical techniques, statistical methods for data analysis, and reporting units.

Involvement of other interested parties, including state agencies, in monitoring of plan implementation will be encouraged. This may entail coordinated monitoring efforts with parties that are able to fund their own participation in such efforts.

This monitoring plan is not static. During the life of the RMP, the monitoring plan will be periodically evaluated to ascertain that the monitoring questions and standards remain relevant, and fine tuned as appropriate. BLM cooperation in the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (still under development) may specifically lead to revision of some elements of this plan.

The total estimated cost of monitoring would be from $546,000 to $765,000 annually.

Air Quality

Expected Future Conditions and Outputs

Compliance with the Oregon Smoke Management Plan and the State Implementation Plan, to help meet established air quality standards in accordance with the Clean Air Act.

Monitoring Questions

1. Are BLM prescribed fires contributing to intrusions into Class I areas, and if so how frequently?
2. Of intrusions attributed to BLM management actions, what was the cause and what can be done to minimize future occurrences?

Standards

1. Use the Oregon Smoke Management Annual Report and any BLM smoke surveillance reports to determine the annual number of intrusions attributed to BLM management actions. Calculate the percentage of total units burned that potentially contributed to such intrusions.
2. Investigate reported intrusions individually to determine the most probable cause and establish possible corrective measures.

Costs

An estimated $3,000 to $5,000 districtwide annually.

Soil Productivity

Expected Future Conditions and Outputs

On forest land allocated for timber production, soils will be managed to maintain long-term productivity by avoiding or minimizing compaction/displacement, erosion, and organic matter loss.

Monitoring Question

Are management practices maintaining soil productivity to the extent expected in the EIS?

Standards

Three components of the soil resource will be monitored as follows:

1a. Determine for each unit that had a compaction concern whether practices established in the RMP to achieve insignificant compaction were implemented and effective.

1b. Compaction is the primary concern when considering changes in soil physical properties. Monitoring of compaction should be accomplished on 20 percent of ground based operations and on 10 percent of high-lead units judged to be sensitive for compaction. Compaction should be assessed by establishing post treatment transect (Howes et al, 1983) and determining compacted areas. Results will be reported in percent of area compacted.

2. Monitor two harvest units per resource area, selecting units that are the most sensitive for erosion (surface or mass wasting) and scheduling monitoring to occur immediately after harvest or site preparation and again five years later. Initial information will be qualitative and obtained by visual, professional estimate. If the initial information indicates unacceptable erosion rates, the soil scientist should use a standard procedure to quantify the rate of erosion.

3a. Determine for each unit that had a nutrition or plant available water concern whether practices established in the RMP to conserve site duff layers and organic material were implemented and effective.

3b. Two harvest units per resource area, judged to be the most sensitive to organic matter removal, should be monitored for organic matter removal by a qualitative, visual, and professional estimate. Stay current with research concerning long-term productivity, especially studies in PNW's Long-Term Productivity Project and COPE (OSU).

Costs

An estimated $4,000 per resource area annually.

Biological Diversity

Expected Future Conditions and Outputs

Contribute to maintenance of diversity of plant and animal species in western Oregon. The vegetative diversity of existing managed forest stands would increase, as to species, canopy layers and dead components. Landscape level (spatial) diversity on BLM-administered lands would be maintained or improved.

Monitoring Questions

What are the effects of BLM management on:

1. Acres of all seral stages?
2. Size and spatial distribution of old-growth blocks?
3. Retention of dead and down material?
4. Number of canopy layers?
5. Tree species composition in managed stands?

Monitoring for several other topics will also address elements of biological diversity, such as, special habitats, special status species, riparian zones, and retention of wildlife trees.

Standards

1. The baseline from BLM's 1988 inventory, as updated to 1992, will be identified. Using Timber Sale Information System and records of losses due to natural disturbance, old-growth forest reductions will be monitored at five-year intervals. Using the Operations Inventory update of approximately year 2000, acres of all seral stages will be recalculated.

2. Using the Operations Inventory update of approximately year 2000, size and spatial distribution of old-growth blocks will be calculated and compared to analysis in the 1993 RMP/EIS.

3. Twenty percent of acres subjected to regeneration harvest and density management will be examined within a year after harvest and site preparation to determine the number of dead and down logs by diameter class, length, and distribution. The trends of dead and down material will be identified on both managed and unmanaged stands, through the decadal forest inventory.

4. Acres of density management accomplished will be identified in the annual work plan accomplishment reports. The number of canopy layers in established stands subject to management actions during the life of the plan will be identified through the decadal forest inventory.

5. First, third, and fifth year stocking surveys will be used to identify tree species composition. Species composition changes in established stands subject to management actions during the life of the plan will be identified through the decadal forest reinventory.

Costs

Item 1 costs are estimated at $1,000 districtwide every five years. Item 2 costs are estimated at $1,000 districtwide. Item 3 can be accomplished concurrent with similar monitoring for retention of wildlife trees, at an annual cost of $2,000 per resource area; its second part would be included in decadal forest inventory costs and difficult to separate. Item 4 would negligibly affect normal data maintenance and inventory costs. Item 5 costs are estimated at $2,000 per resource area annually, in addition to traditional costs of stocking surveys.

Water Resources

Expected Future Conditions and Outputs

Water resources would be managed to protect, maintain, or improve the quality of water resources, stream ecosystems, and watershed values. Water quality would be maintained or enhanced through design of site-specific best management practices (BMPs) in accordance with the Oregon Nonpoint Source Management Plan and the Memorandum of Agreement with Oregon Department of Environmental Quality. BMPs would be implemented, evaluated, monitored, and adjusted as necessary to comply with basin specific water quality criteria.

Monitoring Questions

1. Are site-specific Best Management Practices (BMPs) identified as applicable during interdisciplinary review carried forward into project design and execution?

2. Are prescribed BMPs effective in maintaining or restoring water quality consistent with basin specific water quality criteria for protection of specified beneficial uses?

3. Are cumulative effects within the range anticipated in the RMP/EIS and project specific Environmental Assessments (EAs)?

4. Is stream channel function (inherent stability) being affected by authorized resource management activities?

Standards

1. Twenty percent of timber sales, silvicultural projects, and a sample of other activities stratified by management practice will be randomly selected for monitoring to determine whether or not BMPs were implemented as prescribed. Effectiveness monitoring will be conducted to determine whether implementation of the BMP process is meeting water quality criteria.

   For selected BMPs based on district priority, a minimum of one BMP prescription will be evaluated per Resource Area per year by using photographic record, and a monitoring of appropriate water and physical parameters. This will be done on two or more sites to provide replication. A BMP prescription may be a single practice or a collective set of practices implemented in a region or district. Results of BMP prescriptions evaluated, and determined to be effective, will be shared among districts for efficiency. Effectiveness monitoring will be conducted on all units that are treated with herbicides and contain, or are near water.

   The selection of management actions to be monitored will consider: a) beneficial uses likely to be impacted, b) which BMPs are being prescribed, c) the water quality criteria that are significant to the identified beneficial use(s), and d) what is the logical watershed area to be monitored; e.g., a timber sale unit, a municipal watershed, or the analytical watershed.

   Six to eight baseline watersheds will be gauged and monitored on the District. These watersheds will serve as a control for monitoring undertaken in similar areas to determine long term trends and to provide a basis of separating changes in water quality resulting from natural events from those potentially created by management actions.

   Where established, standard monitoring methods such as those reported in The National Handbook of Recommended Methods for Water-Data Acquisition and Techniques of Water-Resources Investigations of the USGS will be followed. Further, the recent EPA publication “Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska” will help guide monitoring plan development. When Rapid Bioassessment protocols are refined, these procedures will be incorporated into planned monitoring activities.

2. In addition to completing cumulative effects assessments in each environmental assessment for third to fifth order hydrologic units, the "Watershed Condition Index" (WCI), used in the RMP/EIS, may be recalculated once during the plan to assess indices of cumulative effects over large analytical watersheds.

3. Stream function (inherent stability) will be monitored on five percent or 30 miles of third order or larger district streams per year during the next ten years to assess cumulative effects to stream channels. The Forest Service/Northern Region "Stream Reach Inventory and Channel Stability Evaluation" or equivalent method that evaluates stream function will be used.

Costs

An estimated $50,000 Districtwide annually, which includes 10-year amortization of $75,000 in equipment.

Riparian Zones

Expected Future Conditions and Outputs

Maintenance of largely intact riparian management areas (RMAs) along each side of all perennial streams containing large coniferous trees where possible.

Maintenance or improvement of habitat conditions (i.e., numbers of green trees, snags, and down logs) within riparian management areas that provide suitable habitat for long-term productivity of fish, wildlife, and priority plants.

Monitoring Questions

1. What is the average width, by stream order, of RMAs established on the ground and retained following timber harvest and site preparation activities? How does the average width compare to the widths anticipated in the EIS?

2. Are sufficient numbers of mature conifers, snags, and downed trees retained within riparian buffers after harvest?

3. Are RMP-approved disturbances (i.e., yarding corridors) within riparian areas no more than 25 percent of stream length with RMAs in a unit? Did the logging system achieve its objective where disturbance was allowed?

Standards

1 and 2. Twenty percent of harvest acres within each resource area will be examined prior to harvest and site preparation, and re-examined following harvest, to determine whether buffers were retained and their average widths. Timber sale units within watersheds identified for fish habitat or water quality monitoring will be given monitoring preference. Average widths will be determined by measurement at approximately equidistant points along the affected stream reach within each sale unit. Trees, snags and down woody material retained within buffers will be counted before and after timber harvest and site preparation according to the species and size class. Ground cover of herbs and shrubs will be measured before and after harvest in transect or one-square-meter plots.

2. In conjunction with experimental drainage established for fish habitat monitoring, one undisturbed (or essentially so) riparian study site will be established within a representative watershed established within each resource area. The study site will serve as a baseline to compare riparian areas impacted by timber harvest related activities. The changes in habitat conditions will be monitored once during the life of the plan (or after a major land disturbance activity such as blow-down).

3. The extent of the disturbed area along the stream will be measured and compared to RMA objectives. The degree of disturbance will be compared to logging plan objectives to see if the development of the operation plan was adequate, and also, was the implementation of the plan carried out on the ground in compliance with the RMP objectives for RMAs.

Costs

An estimated $10,000 per resource area annually.

Retention of Wildlife Trees

Expected Future Conditions and Outputs

Maintain the following numbers of green trees and snags per acre within harvested units by specific land allocations:

Allocation Area	Number of Stems [1] Per Acre
Old-growth Emphasis Areas	6
Connectivity Areas	12
General Forest Mgt. Areas	6

[1] Green trees should have a minimum diameter of 20 inches.

Monitoring Questions

Are suitable numbers, heights and diameter classes of snags and replacement trees being left, suitably distributed, to achieve the habitat necessary to attain the 60 percent population level districtwide?

Standards

Every five years the population level of dominant woodpeckers sustainable by habitat on BLM-administered lands will be assessed using the analytical technique used in the RMP/EIS to assess the capability of the alternatives. In addition, 20 percent of regeneration harvest units in each resource area will be examined by pre- and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, average diameters and distribution within harvest units. The measure of distribution of wildlife trees will be the percent of this material in the upper, middle, and lower thirds of the sale units monitored. Wildlife trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

Costs

An estimated average of $6,000 per resource area annually.

Roosevelt Elk Habitat

Expected Future Conditions and Outputs

Maintain elk habitat effectiveness indices (HEs, HEr, HEc, and HEf according to Wisdom Model) on BLM-administered lands at levels to maintain at least viable habitat conditions according to the model within each watershed.

Monitoring Questions

Are elk habitat effectiveness indices on BLM-administered lands at expected (in the RMP/EIS) levels within each watershed?

Standards

Elk habitat effectiveness indices on BLM-administered land within analytical elk management areas will be calculated every five years using GIS.

Costs

An estimated $9,000 every five years districtwide.

Special Habitats

Expected Future Conditions and Outputs

Maintenance of undisturbed conditions in each special habitat (e.g., meadows, wetlands, cliffs), considered to be significant by IDT review would be buffered from disturbance by 100 to 200 feet.

Monitoring Questions

Is BLM protecting special habitats as provided in the RMP? Is the average width of undisturbed buffers retained following timber harvest and site preparation activities as specified in the RMP? Is the buffer, as established, effectively protecting the habitat?

Standards

Twenty percent of BLM actions on lands containing or near special habitats within each resource area will be examined to determine whether special habitats were protected as provided in the RMP. Determine average buffer widths by measurement at approximately equidistant points around the affected special habitat within each sale unit.

Costs

An estimated $3,000 per resource area annually.

Fish Habitat

Expected Future Conditions and Outputs

Maintenance and enhancement of fish habitat with diversity and quality capable of maintaining or enhancing populations of anadromous and resident salmonoid game and priority nongame fish species.

Improvement of spawning and rearing habitat, and increase of large woody debris levels.

Monitoring Questions

1. Is fish habitat (relative to the quantity and quality of rearing pools, over-wintering habitat, and smolt production) being maintained or improved as predicted?

2. Is large woody material being retained in the stream channel for fish habitat?

Standards

1. At least one experimental drainage per resource area will be identified to monitor long-term riparian and instream habitat and fish populations (the drainage should be at least five square miles in size, and contain at least 50 percent BLM land). Monitoring will include riparian and instream habitat inventories of all streams used by salmon and/or trout. Outmigrating fish population estimates will be determined for the basin. Index areas will be established for adult spawning escapement. Habitat and summer fish surveys should be conducted using a micro-habitat system that is similar to or currently being used by western Oregon districts (Monitoring Western Oregon Records of Decision H-1734-1, 1986). This is comparable to ODFW research and Hankin and Reeves methodologies. Adult spawning ground counts will be conducted annually using procedures similar to ODFW to index streams.

2. All streams supporting salmonids will be sampled once every ten years for changes in riparian and instream habitat conditions.

Costs

An estimated $13,000 per resource area annually, plus initial costs for equipment of $3,000.

Special Status Species Habitat

Expected Future Conditions and Outputs

Conservation or recovery of special status species and their habitats so that listing under the Endangered Species Act (ESA) is not needed.

Monitoring Questions

1. Are BLM actions and BLM-authorized actions designed and implemented to protect or enhance special status species and/or their habitat to the extent required by the ESA, Bureau policy, or as directed in the RMP?

2. Are the mitigation and protection measures employed effective?

Standards

1. Annually 20 percent of the files on each year's timber sales and other relevant actions (e.g., rights-of-way, instream structures) will be reviewed to evaluate documentation regarding special status species and related recommendations and decisions regarding ESA requirements, policy, and RMP decisions. Review will ascertain whether required mitigation was incorporated in the authorization document. The relevant actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.

2a. Habitat conditions will be monitored at all or a representative sampling of known sites of all listed, proposed, candidate, state listed, and Bureau sensitive plant and animal species identified as occupying sites potentially affected by Bureau actions, both before and within a year after site disturbance and/or at intervals of at least five years. Population trends of special status species at such sites will also be monitored. Monitoring will particularly evaluate effectiveness of mitigating measures.

2b. Northern spotted owl monitoring will focus on population characteristics on BLM-administered lands throughout the range and on habitat condition and trend relative to BLM's management strategy.

Population monitoring, including banding, will be an adaptation of ongoing BLM efforts which would conform to recommendations in the final recovery plan, after it is adopted. The draft recovery plan released by the Fish and Wildlife Service recommended that monitoring should involve five initiatives under a comprehensive program. These are as follows:

- Roadside survey of territorial birds: Survey would provide census or index data on territorial owls relative to a spectrum of habitat abundance strata.

- Owl activity site monitoring: Specific surveys of known sites would provide information on occupancy, reproduction, turnover rates, and survival.

- Transmitter studies of dispersing juveniles, and territorial and non-territorial adults: The use of radiotelemetry systems would provide specific information on movements of dispersing juveniles and the habits of non-territorial birds in relation to the territorial population.

- Other related studies: Additional work beyond that already described would explore elements such as age ratios of first time breeders and the further development of landscape level computer models.

- Coordination and integration of the above initiatives: A specific effort will organize and interpret results from all aspects of the monitoring program to assemble information in a form that will permit evaluation of management and modification of the recovery plan, if necessary, along with data to support delisting, when appropriate.

Habitat monitoring will determine whether the BLM's land allocations and prescriptions are implemented as planned. Additional efforts will track whether habitat condition and trend patterns track those predicted and meet the expectations of the prescriptions employed to provide the desired habitat condition.

Costs

An estimated $2,000 per resource area annually for Standard No. 1. For Standard No. 2, the costs districtwide are as follows:

Plants and animals - $2,000 per site each year visited.

Spotted owls - $300,000 - $500,000 per province.

Districtwide for Coos Bay, the estimated cost of monitoring special status species habitat is expected to be $200,000 annually.

Areas of Critical Environmental Concern (ACECs)

Expected Future Conditions and Outputs

Maintenance of ACECs in accordance with their objectives, to protect the values for which they were designated.

Monitoring Questions

1. Are BLM actions and BLM-authorized actions consistent with RMP objectives for designated ACECs?
2. Are the special values of ACECs being maintained?

Standards

1. All actions within and adjacent to ACECs will be reviewed to determine whether the possibility of impacts on ACEC values was considered, and whether any mitigation identified as important for maintenance of ACEC values was required and, if so, was actually implemented.
2. Each ACEC will be monitored annually to determine if unauthorized uses are occurring and whether ACEC values are being maintained.

Costs

An estimated annual average of $9,000 districtwide.

Visual Resources

Expected Future Conditions and Outputs

Preservation of existing visual qualities in all areas designated by Congress for exclusive management (i.e., VRM Class I areas) and conservation of visual qualities in areas within 0.25-mile of recreation sites, state and federal highways, state scenic waterways, and wild and scenic rivers (i.e., VRM Class II and III areas).

Monitoring Questions

Are management actions (primarily timber harvesting) in VRM Class II and III areas meeting or exceeding visual resource management class objectives?

Standards

All timber harvests and other selected projects in VRM Class II areas, and 25 percent of harvests or projects in Class III areas that have special design features or mitigating measures for visual resource protection, will be monitored to evaluate the effectiveness of the practice used to conserve visual resources. The method will consist of a post timber harvest or project construction visit to evaluate success or failure based on professional judgement. In VRM Class II management areas, where two or more sales or actions have occurred, impacts will be monitored at a minimum interval of five years to determine total cumulative impacts.

Costs

An estimated $2,000 per resource area annually.

Reforestation and Timber Management Practices

Expected Future Conditions and Outputs

Timber sale levels are as projected in the RMP/EIS. Design and logging of timber sales under the constraints of the RMP is feasible. Harvested units are reforested at a stocking level and managed at an intensity which attains growth and yield that will achieve projected outputs.

Monitoring Questions

1. Are timber sale volumes and harvest acres within 10 percent of those projected in the RMP/EIS?
2. Has BLM been able to design and sell timber sales that meet the standards set forth in the RMP on all categories of lands where sales were expected during the life of the plan?
3. Were the acres receiving management practices (e.g., planting with genetically selected stock, stand maintenance, fertilization, release, and thinning) as projected in the RMP/EIS?
4. Is reforestation achieving desired stocking, particularly in connectivity areas?
5. Are stands growing at a rate that will produce the predicted yields?

Standards

1 & 3. Annual timber sale volumes and acres to be harvested will be identified in annual work plan accomplishment reports.

2. An annual districtwide year end review will address whether the district was able to offer and sell timber sales that meet RMP standards.

4. First, third, and fifth year stocking surveys will be used.

5. Managed stand inventory (as part of the decadal forest inventory) will provide actual growth data to be reported once every 10 years.

Costs

An estimated $18,000 per resource area annually.

Rural Interface Areas

Expected Future Conditions and Outputs

BL-administered land within 0.25-mile of identified rural interface areas zoned for 1 to 20-acre lots is managed in such a manner as to mitigate adjacent landowner concerns when reasonable to do so. Forest management practices are altered when reasonably feasible.

Monitoring Question

Is management in identified rural interface areas consistent with listed practices in the RMP?

Standards

All actions within 0.25-mile of the identified rural interface areas will be reviewed to determine if special project design features and mitigation measures are implemented as planned.

Costs

An estimated $4,000 districtwide annually.

Socioeconomic Conditions

Expected Future Conditions and Outputs

Contribution to local employment and county revenues by providing outputs that support approximately 1,600 jobs and $28.2 million annually of payments to the O&C counties, and $0.3 million annually of CBWR payments.

Monitoring Questions

1. What level of local employment is supported by BLM timber sales and forest management practices?
2. What were O&C payments to counties (and CBWR payments)?

Standards

1. Using current multipliers, annual BLM timber sales and harvest volume will be related to supported employment. Similarly, labor-intensive management practices each year will be related to jobs.
2. Annual O&C and CBWR payments will be reported.

Costs

An estimated $1,000 annually districtwide.

Appendix II-P

Possible Research Topics

The following list of possible research topics would be modified based upon available funding, and changing knowledge and priorities.

Water

Refine/evaluate a cumulative impact analysis model to assess effects of various management activities (including identification of hydrologic recovery rates) in third-order to fifth-order watersheds.

Identify roles of first and second-order streams on the overall productive capability of the aquatic ecosystem, and the effect of different management prescriptions.

Biological Diversity

Develop methods for measuring diversity in forest stands.

Assess effects of natural fires, prescribed fire and fire exclusion on biological diversity.

Assess effectiveness of silvicultural systems and silvicultural practices in the retention or enhancement of biological diversity within a forest environment managed for the production of timber and other commodity values.

Develop improved indices and methods for measuring and describing both the diversity of habitats and species on forest sites and in determining the effect of silvicultural systems on ecosystems processes, wildlife and plant populations, and species survival.

Evaluate effectiveness of silvicultural practices and forest genetics programs in retaining the genetic diversity of managed forests, including both improved conifer species and other organisms.

Assess effects of natural fires, prescribed fire, and fire exclusion on the structures and functions of southwestern Oregon ecosystems and upon habitat connectivity.

Assess a variety of silvicultural practices, structural retention levels, density management regimes, and species mixes on the stability and health of forest ecosystems.

Wildlife

Define habitat requirements and preferences of amphibians and reptiles (particularly those that are special status species).

Identify how management activities affect those species and what management prescriptions can minimize impacts on them.

Identify how spotted owls respond to alternative timber harvest prescriptions.

Identify how landscape-level habitat patterns in the checkerboard ownership pattern affect spotted owl occupancy, reproduction, survival and juvenile dispersal.

Identify the vegetation structure characteristics and histories of forest stands used by spotted owls as foraging habitat.

Riparian Zones

Assess the effect of different buffer widths and compositions, and the influence of differing management prescriptions on adjacent lands upon the plants and animals of the riparian zone.

Fish

Assess effectiveness of various riparian protection prescriptions for maintaining natural stream processes, especially relative to production of anadromous and resident fish.

Assess the effects of fish habitat improvement projects on aquatic invertebrate fish food sources, as well as fish populations, and the useful life of the projects.

Forestry

Determine effects of managing stand structure to meet a variety of forest management objectives including the practicality of producing old-growth forest features within shorter rotations.

Develop silviculture systems to improve reforestation, species diversity, timber yield and ecosystem functions.

Appendix III

Appendices

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Appendix III-A
Lands and Transportation

Table III-A-1. Existing Land Use Classifications

Type of Classification	Location	Acreage [1]	Purpose	Segregative Effect
R&PP (OR 38907)	T.28S., R.11W. Sec. 5: Lots 9-12, 14	18.27	Coos County Rehabilitation Farm	Withdrawn from appropriation under general land laws and mining laws.
R&PP (OR 016152)	T.27S., R.11W., Sec. 5: Pors. S1/2NW1/4,N1/2SW1/4 Lot 1, SE1/4NE1/4	129.40	County Park Laverne	Withdrawn from appropriation under general land laws and mining laws.
R&PP (OR 7761)	T31S., R.12W Sec. 13: Por. Lot 18	0.66	School play-ground, Powers	Withdrawn from appropriation under general land laws and mining laws.
R&PP (OR 46140)	T.26S., R.14W. Sec. 3: Por. SE1/4NE1/4	0.37	Charleston RFPD Fire Hall Community Bldg.	Withdrawn from appropriation under general land laws and mining laws.

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[1] Acreage derived from Master Title Plat

Table III-A-2. Pending Coos Bay Shorelands Withdrawal OR 46538

Federal Lands

T.25 S., R.13 W.,	Sec. 4, N1/2NW1/4 Sec. 5, NW1/4NW1/4 Sec. 6, E1/2SE1/4, SE1/4NE1/4, Lots 1,2,3 and 4 Sec. 7, E1/2SW1/4, NE1/4, SE1/4NW1/4, SW1/4SW1/4, Lots 2,3,4,5,6,7 and 8 Sec. 18, NW1/4, NW1/4SW1/4, Lots 7 and 8
T.25 S., R.14 W.,	Sec. 12, Lot 1 Sec. 13, E1/2SE1/4, Lots 1,2,3 and 4 Sec. 23, Lot 1 Sec. 24, NE1/4SW1/4, W1/2NE1/4, Lots 6,7,8,9,10,11,12,13 Sec. 25, Lot 3 Sec. 26, Lots 8,9 and 10

The area described above contains 1,972.28 acres in Coos County, Oregon.

Private Lands

T.24 S., R.13W.,	Sec. 32, E1/2SW1/4
T.25 S., R.13 W.,	Sec. 5, SW1/4NE1/4 Sec. 8, Lot 3 Sec. 18, NE1/4SW1/4, Lot 3 and 4 Sec. 19, Lot 4
T.25 S., R. 14W.,	Sec. 24, Lot 4 Sec. 25, Lot 1

Along with any accretion to the above-listed private lands, the area described above contains 307.13 acres in Coos County, Oregon.

Acreage described above is derived from the Master Title Plat.

In furtherance of the draft Coos Bay Shorelands Management Plan, a petition for a protective withdrawal of the lands within the plan area (1,972.28 acres of public land and 307.13 acres of private land) was filed and subsequently approved on February 19, 1991 to allow for the filing of a withdrawal application. The application, when approved, will serve to withdraw the public lands from location or entry under the mining laws and also withdraw any private lands within the Special Recreation Management Area which become public lands in the future. The public lands have been segregated from the mining laws since the approval of the petition. The purpose of the proposed withdrawal is to protect the Coos Bay North Spit Special Management Recreation Area.

Table III-A-3. Pending New River Withdrawal OR 45401

Federal Lands

T.30S., R.15W.,	Sec. 2, Por. Lot 4, W1/2SW1/4
	Sec. 3, Lots 3, 4
	Sec. 10, Lots 1-4, E1/2NE1/4, SW1/4SE1/4
	Sec. 11, Por. W1/2NW1/4, SE1/4NW1/4
	Sec. 15, Lots 1-4, NW1/4NE1/4
	Sec. 21, Lot 2
	Sec. 22, Lots 1, 2, NW1/4SW1/4
	Sec. 28, Lots 2, 3, SE1/4NE1/4
	Sec. 32, Lot 1
	Sec. 33, Lot 2

The area described above contains 963 acres in Curry County, Oregon.

Private Lands

T.29S.,R.15W.,	Sec. 35, Lots 1, 2
T.30S., R.15W.,	Sec. 2, Por. Lots 3, 4, S1/2NW1/4
	Sec. 3, Lots 1, 2
	Sec. 10, Lot 6
	Sec. 11, NW1/4SW1/4
	Sec. 21, Lot 1
	Sec. 28, Lot 4
T.31S., R.15W.,	Sec. 4, Por. SW1/4SW1/4
	Sec. 5, Lots 1, 2, Por. SE1/4SE1/4
	Sec. 7, Lot 1
	Sec. 8, Lots 3-6, N1/2NE1/4, Por. SW1/4NE1/4
	Sec. 9, NW1/4NW1/4

The areas described aggregate, including any accretion thereto, approximately 767 acres of private lands in Coos and Curry Counties, Oregon.

Acreages described above are derived from the Master Title Plat

In support of the New River ACEC Management Plan, a petition for a protective withdrawal of the lands within the ACEC boundaries (962.95 acres of Federal land and 767 acres of private land) was filed and subsequently approved on March 19, 1990 to allow for the filing of a withdrawal application. The application, when approved, will serve to withdraw the public lands from surface entry, location and entry under the mining laws and also withdraw any private lands within the ACEC area which become public lands in the future. The public lands have been segregated from surface entry and the mining laws since the approval of the petition. The purpose of the proposed withdrawal is to protect the many unique resources found within the ACEC, including one of the youngest rivers in North America, prehistoric cultural sites, critical habitat for four species of threatened or endangered wildlife, and outstanding recreational values.

Table III-A-4. Proposed Dean Creek Withdrawal

T.21S., R.11W.,	Sec. 31, Por. Lot 4
	Sec. 32, Por. Lots 5, 6, 7, 8
	Sec. 33, Por. Lot 7, Lot 8, Por. S1/2SW1/4, Por. SW1/4SE1/4, SE1/4SE1/4
	Sec. 34, Lots 5 and 6
T.22S., R.11W.,	Sec. 3, Por. Lot 14, Lot 15
	Sec. 4, Por. SE1/4NE1/4, W1/2NE1/4, NE1/4NE1/4, NW1/4
	Sec. 5, Lots 1, 2, Por. NW1/4, W1/2NE1/4
	Sec. 6, Lots 1, 2, 3, Por. NE1/4

The areas described aggregate approximately 1,040 acres in Douglas County, Oregon.

Acreages derived from the Master Title Plat.

The Dean Creek Elk Viewing Area Habitat Management Plan (HMP), approved on December 19, 1986, does not address the need for a protective withdrawal. Since formulation of the HMP, BLM has invested thousands of dollars in developing the Dean Creek Elk Viewing Area (924 acres) and will continue to develop the site further as well as acquire additional lands to expand the area. These investments, combined with the management prescriptions for the Dean Creek Elk Viewing Area, necessitate the need for a protective withdrawal to preclude other potential uses which would destroy the integrity of the elk viewing area. Withdrawal of the lands from the operation of the mining laws and public land laws is the only way to eliminate all other nonconforming uses of the lands within the Dean Creek Elk Viewing Area.

Table III-A-5. Proposed Withdrawal Relinquishment

U.S. Corps of Engineers
Coos Bay Jetty Project

T.25 S., R.13 W.,	Sec. 18 - W1/2NW1/4, NW1/4SW1/4, Lot 8
T.25 S., R.14 W.,	Sec. 13 - E1/2SE1/4, Lots 1 and 2
	The area described contains 313.84 acres.

The withdrawal established by EO11/13/1889, OR 19228 held by the U. S. Army, Corps of Engineers, (Coos Bay Jetty Project) was partially revoked in 1984. With the development of the Coos Bay Shorelands Special Recreation Management Area, BLM recognized a need to having administrative jurisdiction over all federal lands on the Coos Bay North Spit to facilitate the area's management. The Corps of Engineers has agreed to consider relinquishment of the remaining 313.84 acres of the withdrawal and incorporation of the lands into the existing right-of-way reservation OR 36509.

Table III-A-6. Proposed Administrative Withdrawals

Site Name	Legal Description	Acres
Wassen Seed Orchard	T. 21 S., R. 9 W., Sec. 10 SE1/4NW1/4	26
Johns Peak Test Site	T. 23 S., R. 9 W., Sec. 27 NE1/4SW1/4	24
Burnt Ridge	T. 26 S., R. 9 W., Sec. 33 N1/2NW1/4	12
Elk Run	T. 26 S., R. 10 W., Sec. 8 SE1/4SW1/4	5
Elk Run	T. 26 S., R. 10 W., Sec. 17 NE1/4NW1/4	9
Big Basin	T. 26 S., R. 12 W., Sec. 15 SE1/4SE1/4	1
Lookout Ridge	T. 26 S., R. 12 W., Sec. 35 SE1/4NE1/4, N1/2SE1/4	15
Middle Fork Brummet Creek	T. 27 S., R. 9 W., Sec. 19 SE1/4SE1/4	2
Joe Colombo	T. 27 S., R. 9 W., Sec. 29 SE1/4NE1/4, NE1/4SE1/4	10
Middle Fork Brummet Creek	T. 27 S., R. 9 W., Sec. 30 NE1/4NE1/4	2
Brewster Rock	T. 27 S., R. 10 W., Sec. 29 SE1/4NE1/4	9
China Wall	T. 27 S., R. 10 W., Sec. 31 NE1/4SE1/4	2
China Wall	T. 27 S., R. 10 W., Sec. 32 NW1/4NW1/4	4
Cultus	T. 27 S., R. 11 W., Sec. 22 SW1/4SW1/4	10
Cherry Creek	T. 27 S., R. 11 W., Sec. 23 S1/2NW1/4	8
Cultus	T. 27 S., R. 11 W., Sec. 27 NW1/4NW1/4	4
Camas Creek	T. 28 S., R. 11 W., Sec. 36 NW1/4NE1/4	13
Elk Creek	T. 28 S., R. 11 W., Sec. 36 N1/2N1/2	13
Weekly Creek	T. 28 S., R. 12 W., Sec. 36 E1/2SE1/4	11
Sandy Single	T. 29 S., R. 10 W., Sec. 2 S1/2SE1/4	11
Slater Creek	T. 30 S., R. 9 W., Sec. 17 SW1/4NW1/4	11
Russell - Eckley	T. 30 S., R. 12 W., Sec. 29 S1/2SE1/4	3
White Mountain	T. 31 S., R. 14 W., Sec. 17 NW1/4NW1/4	12
Lobster Hill	T. 35 S., R. 13 W., Sec. 20 center of section	13
Northern Prairie	T. 39 S., R. 13 W., Sec. 13 NE1/4NE1/4	11
Black Mound	T. 40 S., R. 13 W., Sec. 20 NE1/4NW1/4	13
Shot Gun Quarry	T. 26 S., R. 9 W., Sec. 17 SW1/4SE1/4	2
Tioga Creek Quarry	T. 26 S., R. 9 W., Sec. 31 NW1/4SE1/4	3
Moon Creek Quarry	T. 26 S., R. 11 W., Sec 35 SW1/4NW1/4	4
Buck Peak Quarry	T. 27 S., R. 9 W., Sec. 10 NW1/4NW1/4	2
Elk Wallow Quarry	T. 27 S., R. 9 W., Sec. 14 SE1/4SE1/4	21
Burnt Mountain Quarry	T. 27 S., R. 9 W., Sec. 24 SW1/4SE1/4	5
Lavern Stockpile	T. 27 S., R. 11 W., Sec. 5 NW1/4SE1/4	2
Sandy Quarry	T. 28 S., R. 10 W., Sec. 27 SE1/4SE1/4	11

The sites listed in Table III-A-6 include progeny test sites, seed production areas, or rock quarries that are proposed for administrative withdrawal. The BLM has invested thousands of dollars in development and maintenance of the sites, necessitating the need for protective withdrawals to preclude other potential uses. Withdrawal of the lands from the operation of the mining and public land laws would eliminate all other nonconforming uses.

Table III-A-7. Existing Right-of-Way Agreements

Permit & Agreement No.	Permittee
C-48	Georgia Pacific Corporation
C-68	Champion International Corporation
C-76	Smith and Bice
C-85	Coos Bay Timber Company
C-89	International Paper Company
C-103	Myrtle Point Veneer
C-270	Weyerhaeuser Company
C-286	Georgia Pacific Corporation
C-287	Georgia Pacific Corporation
C-330	Georgia Pacific Corporation
C-333	Bohemia Incorporated
C-339	International Paper Company
C-344	Georgia Pacific Corporation
C-354	Georgia Pacific Corporation
C-358	Thelma and Severt Iverson
C-364	Moore Mill and Lumber Company
C-390	Cherry Creek Mill Company
C-395	Coos Head Timber Company
C-403	South Coast Lumber Company
C-418	Al Peirce Lumber Company
C-421	Roseburg Resources
C-423	Glae Gould
C-435	Carl Thomas
C-437	Ray Shepard
C-440	International Paper Company
C-441	Cherry Creek Mill Company
C-456	Weyerhaeuser Company
C-459	International Paper Company
C-468	International Paper Company
C-497	Wooley Enterprises, Incorporated
C-509	Menasha Corporation
C-586	International Paper Company
C-599	Menasha Corporation
C-625	Lone Rock Timber Company
C-636	International Paper Company
C-647	Lone Rock Timber Company
C-681	Capital Veneer
C-706	South Coast Lumber Company

Appendix III-B
Summary of Basic Principles

The beneficial uses of water resources of primary concern related to land management activities are rearing and spawning habitat for salmonoids, domestic water supply, fishing, and water contact recreation. In all of these uses, high quality water is important.

Forest hydrology is a collection of complex processes which transform precipitation to streamflow or ground water.

Water Quantity

Precipitation

Oregon's latitude, topography and location near the Pacific Ocean have a great influence upon its climate. The Coast Range and Cascade Mountains also play a major role in rainfall patterns. As moisture-laden air travels inland from the ocean, it ascends to cross the mountains. As the air rises, the moisture is cooled and condensed, falling as rain or snow. Snowfall distribution is influenced by elevation, but is transitory and does not remain on the ground long enough on the Coos Bay District to significantly affect stream runoff characteristics.

Oregon's rainfall pattern gives the Coos Bay District a plentiful water supply between October and March when 80 percent of the annual precipitation is received. Further analysis shows 50 percent occurs between November and January. June, July and August (the driest months) receive only four percent of the annual precipitation, which amounts to five inches or less on most areas of the South Coast. Areas near the coast are influenced by a marine onshore air flow pattern during the summer with frequent morning fog and more even daily temperatures. Average annual precipitation is very elevation dependent, ranging from 50 to 70 inches along the coast and up to 120 inches elsewhere on the district.

Precipitation is an important climatic variable that influences the productivity and management of forest lands. Estimates of precipitation are used for planning numerous forest management activities such as the location, design and maintenance of forest roads, and the selection and scheduling of harvesting and reforestation systems.

Interception occurs when rain or snow lands on vegetation rather than the ground. Some of this intercepted water evaporates and the remainder falls to the ground. Evaporation of water also occurs from surfaces of water bodies and soil surfaces. Under forested conditions, evaporation from soil surfaces is minimal. The process by which water is taken up by plants and discharged to the atmosphere is known as transpiration.

Infiltration is the movement of water into the soil surface. When the rainfall rate exceeds the rate of infiltration, water will travel over the ground surface to a channel. This is known as overland flow. Infiltration rates usually far exceed the maximum rates of rainfall in undisturbed forest soils in western Oregon, thus allowing most water that reaches the earth's surface to enter the soil.

Infiltration rates are reduced by soil-disturbing activities such as road building and tractor logging. These activities tend to compact the soil surface, causing some water to flow overland until it reaches nearby undisturbed soils or a stream channel.

Removal of forest vegetation drastically reduces the amount of precipitation that returns to the atmosphere as a result of interception and transpiration. This allows more precipitation to reach the soil surface and drain into streams or become ground water. The return of vegetation results in annual streamflows decreasing to preharvest levels as both interception and transpiration increase. Evaporation from the soil surface is generally increased after timber harvest; however, this increase is greatly offset by the reduction in transpiration.

Streamflow

The amount of water draining from a given area in a year is referred to as the annual water yield and is usually expressed in acre-feet (43,560 cubic feet) or the average depth over an area in inches. The annual yield of an area can be converted to the average annual flow given in cubic feet per second (CFS), of the stream draining the area.

Streamflow is the water that reaches the stream channel. Total streamflow is a product of all the other processes in the hydrologic cycle. Distribution of annual streamflow in western Oregon is closely related to the distribution of annual precipitation, thus high flows are observed during the winter and low flows are predominant in the summer.

The effect of timber management activities (road construction, timber harvest, and slash disposal) on streamflow in small headwater basins is primarily related to removal of forest vegetation and disturbance of the natural soil surface. Removing forest vegetation reduces evapotranspiration, thereby increasing the amount of rainfall available for streamflow. Studies of small watersheds in western Oregon showed that annual water yields from clearcut areas increased 26 to 43 percent following harvest (Harris 1977; Rothacher 1970; Harr et al. 1979).

The amount of increase in streamflow resulting from removal of forest vegetation is proportional to the type of harvest, the area harvested within a specific watershed, and the time elapsed since harvest. Streamflow increases are most noticeable in small watersheds that have large areas of vegetation removed over a short time period. Streamflow increases in large basins tend to be masked because the nonvegetated area is small relative to the size of the basin.

The duration of increased water yield is not easily predicted; however, Harr (1983) found that, on the average, 27 years would be required for water yield increases to disappear. Increases in streamflow due to vegetation removal are not distributed evenly throughout the year. Increases in summer flows appear large when compared to the naturally low levels of streamflow during the summer months. The increases in summer streamflow result from greatly reduced transpiration allowing more water to drain through the soil to the streams. Summer increases are relatively short-lived because of the rapid growth of vegetation along stream channels.

Increases in streamflow following timber removal are greatest in fall because soil moisture content on the harvested areas is higher than under forested conditions. Therefore, a smaller amount of fall rains is used for soil moisture recharge and a larger proportion becomes streamflow. Timber removal has little effect on the size of large peak flows, which cause extensive downstream flooding. Large peak flows are caused by such great amounts of precipitation that differences in soil moisture content between harvested and forested areas become insignificant and both areas respond nearly the same.

Soil disturbance may have an influence on the frequency and magnitude of small and large peak flows. The degree of influence depends upon the amount of area compacted by roads and tractor skid roads, and the proximity of the compacted area to stream channels.

Recent watershed studies have shown that timber harvest in the transient snow zone has increased the magnitude of peak flows. The transient snow zone is located at elevations where the snow level fluctuates throughout the winter in response to alternating warm and cold fronts. Snow accumulation is greater in clearcut openings than in undisturbed forest. Rain-on-snow events result in rapid melting of these shallow snowpacks. More snowmelt is generated from clearcut openings than from forested areas, resulting in larger peak flows. Streamflow does not always increase following the removal of vegetation. In some areas, reduced fog interception and drip following logging apparently reduces annual precipitation enough to offset expected reductions in transpiration. In coastal areas, fog drip may account for as much as 30 percent of the total water reaching the forest floor; thus, removal of forest vegetation may actually decrease annual streamflow (Harr 1983b).

Water Quality

Stream temperature, turbidity, sediment, dissolved oxygen, and chemical water quality are important water quality parameters to observe, since they indicate the ability to protect those beneficial uses listed in the OAR, Chapter 340-41.

Streams flowing from undisturbed forests generally have excellent quality. This characteristic makes streams valuable for domestic water supply, fish production and recreation. Natural processes such as surface erosion, landslides, and flood events can increase sediments in stream channels, thereby causing a detrimental effect on

water quality.
Sediment and water temperature are the two water quality factors influenced most by timber harvest and road construction.

Units of Measurement

Water temperature is measured in degrees Fahrenheit (°F) or degrees Celsius (°C); turbidity is measured in Jackson or Nephelometric Turbidity Units (JTUs or NTUs); conductivity is measured in microseimens (°S); and bacteria are measured in number of organisms per 100 milliliters (ml). Most chemical parameters of interest, as well as most sediment data, are reported in terms of concentrations, discharge, or yield. Water quality data is usually reported as concentrations or weight per unit volume (usually milligrams per liter (mg/l) or micrograms per liter (ug/l). In the dilute waters of western Oregon, mg/l equals parts per million (ppm), and micrograms per liter equals parts per billion (ppb). Frequently, in the case of sediment and occasionally in the case of chemicals, data is expressed in terms of discharge (i.e., weight or volume per unit time tons per day or cubic feet (cf) per year). Occasionally sediment or chemical data is also expressed as yield (i.e., weight or volume per unit area of the watershed-tons per acre or acre-feet per square mile or kilograms per hectare).

Stream Temperature

Timber harvest affects stream temperature by removing shading vegetation from streambanks. Stream temperature increases of 10° F or more have been recorded following removal of streamside vegetation by clearcutting and burning in both the Oregon Cascades and Coast Range (Brown and Krygier 1970; Levno and Rothacher 1969). Because downstream shading does not significantly lower temperatures of streams warmed by upstream exposure (Brown 1970), water temperatures of larger streams can also increase when small tributaries are exposed by clearcutting. The magnitude of this effect is dependent on the temperature and quantity of ground water inflow, as well as inflow from other well-shaded tributaries. The primary concern with water temperature increases is the potential for detrimental effects on fish and other aquatic organisms.

Chapter 340 of the OAR sets standards for water temperature in streams. These standards require no measurable increases when stream temperatures are 58° F or greater, and in no case may the increase in water temperature be more than 2° F. For application of the standards, maximum summer stream temperatures may be estimated with an equation developed by Schloss (1985), and temperature increases from removal of shading vegetation may be estimated from an equation developed by Brown (1970). Recent computer models, such as the one developed by Beschta (1984), may be used to estimate both ambient stream temperatures and changes resulting from management, for both individual stream reaches and networks of streams.

Sediment

Soil erosion is the main source of sediment in water. Some soil is eroded naturally through weathering processes of rain and wind, but the main causes of soil loss are agricultural practices, timber harvesting, road and building site construction, and mining activities.

Sediment clouds water, chokes fish gills, blankets fish spawning areas and smothers bottom aquatic habitats. Sediment also increases the cost of treating drinking water. Chemicals such as pesticides and nutrients often bind to sediment particles.

The larger peak flows described above have a direct relationship to increases in the amount of sediment transported downstream. Peak flows may result in streambank erosion and scouring of channel beds. Forestry practices may also contribute to sediment entering streams by surface erosion or landslides. The occurrence of surface erosion or landslides resulting from forest management activities is dependent on natural rates of surface erosion and landslide frequency, climatic factors and the type of activity. Landslide prone areas are avoided if possible in timber harvest and road construction. Roads continue to be a major source of stream sedimentation, although improved methods for design, location, construction and resurfacing of dirt road with rock over the past 10 years have greatly reduced the amount of sediment contributed by roads.

Timber management (road construction, timber harvest, and slash disposal) and other ground-disturbing activities can affect sediment levels in district streams by increasing the capacity of the streams to entrain and transport sediment and by increasing the supply of sediment available for transport. Forestry-related sediment problems can be reduced by carefully constructing logging roads and stream crossings, installing culverts to carry runoff, and providing wide setbacks (buffer zones) from streams when timber is harvested.

Construction and mining activities typically disturb large tracts of land which contributes to sediment problems.

Instream sediment levels are both transport (flow) and supply dependent. Paustian and Beschta (1979), VanSickle and Beschta (1983), and Jackson and Beschta (1982) described bedload transport in terms of supply of material available for transport at various levels of flow; they found that most bedload transport occurred during short periods of high water, when flows were sufficient to entrain coarse, armoring riffle sediments and to access supplies of finer material within the riffle. Subsequent studies (Jackson and Beschta 1984) have demonstrated that increased amounts of sand in transport can cause previously stable, coarse riffle sediments to undergo scour.

This data reveals that the effects of management activities on sediment transport are directly related to the effects on high flow events. The results of increased high flow events would be increased sediment concentrations and more frequent episodes of riffle scour and fill.

The effect of management activities on the supply of sediment available for transport depends on the average slope of the contributing area and the type of erosion processes dominant in the area of the activity. On gently sloping topography with competent bedrock there would be little, if any, increased erosion (Fredriksen and Harr 1979). On steeper slopes, surface erosion (known as dry ravel) occurs, especially after slash burning. It is not known how much eroded material reaches streams and becomes sediment. In areas where debris avalanching is the dominant erosion process, clear cutting has increased the natural rate of avalanching two to four times, and road building can increase the natural rate of erosion as much as 25 to 340 times (Fredriksen and Harr 1979). They also reported that mean annual suspended sediment concentration in a clearcut watershed, without roads, was about nine times the natural concentration (in an undisturbed forest); mean annual sediment concentration in a patchcut watershed, with roads, was about 23 times the natural concentration. Roads sometimes contribute to increased sediment concentrations through erosion from the road surface, cut slopes, and fill material. Road construction can increase erosion as much as 250 times in the first storms after construction, but concentrations usually drop off within a few months to two years (Brown 1983). More extended periods of sediment increase may be associated with the use of roads by heavy trucks during very wet weather or on poorly surfaced roads, or with unauthorized off-road vehicles (ORV) use. Compacted soils (from roads, skid trails, or heavy equipment use) can cause gully erosion and locally large increases of sediment.

Nutrients

Nutrients enter water mainly from treated municipal sewage discharges, failing septic tank systems, and from fertilizers washed into the water by rain or irrigation. Excessive amounts of nutrients released into slow moving waters during spring and summer can result in growths of algae and aquatic weeds. Algae blooms reduce the amount of oxygen available to fish, which can result in fish kills.

To address this problem of algae growth, the Oregon Environmental Quality Commission (EQC) adopted a chlorophyll standard. The amount of chlorophyll in water indicates the amount of aquatic plant growth. Waters violating this standard will be studied to determine the nutrient sources and options for controlling the problem. Maintaining or restoring the quality of the Coos Bay District's more heavily used lakes is also an important issue. Lakes undergo a natural aging process which can be accelerated by human activities. Agricultural, forestry, and other land use practices can cause soil erosion introducing sediment and nutrients into lakes.

Sediment from soil erosion can rapidly fill a lake or reservoir, while nutrients increase the frequency of algal blooms and accelerate aquatic weed growth.

Shallow, nutrient-rich lakes often have impaired recreational and aesthetic values. This is especially true for lakes that are "old" in their stage of development, which means they have high nutrient levels and are naturally more marshlike.

Timber Harvest and Slash Disposal

Timber harvest and slash disposal can affect the chemical quality of surface water. In one Oregon Cascades watershed, following slash burning, instream concentrations of ammonia-nitrogen and manganese reached peak levels of 7.6 and 0.44 mg/l respectively (Fredriksen 1971). Fredriksen attributed the high concentrations of ammonia-nitrogen and manganese to burned slash in stream channels.

The aerial application of herbicides is another management activity that can affect the chemical water quality of streams. A detailed discussion of potential water quality impacts of herbicides proposed for use by the BLM is beyond the scope of this analysis. The reader is referred to the Final Environmental Impact Statement (FEIS) for the Western Oregon Program for the Management of Competing Vegetation (USDI, BLM, OSO 1989).

Application of nitrogen fertilizers also affects the chemical water quality of streams. Nitrogen is usually added to the soil by aerial application of urea pellets. Since direct fertilizer application is the major pathway for urea entry to streams, urea concentrations usually peak within one to two days following fertilizer treatment. Ammonia nitrogen, a hydrolysis product of urea, also usually peaks shortly after treatment, since it is derived from urea entering the stream.

Ammonia nitrogen in the soil is held very tightly. Only nitrate nitrogen is readily leached from the soil, and this usually occurs after the ammonia is oxidized to nitrate during the warm growing season. For this reason, peak nitrate concentrations are often recorded one to two years after fertilization. On the other hand, if nitrogen fertilizer is applied shortly after an area has burned, the warm soil temperatures may enhance nitrification and subsequent leaching of nitrate to the stream. Moore (1975) summarized several water quality monitoring studies of forest fertilization with urea throughout the Pacific Northwest and found maximum recorded nitrate values were usually less than one mg/l and in all cases were less than 5 mg/l.

Stream Categorization

Streams are characterized by their "order" (Strahler 1957). Headwater stream channels are designated first order; two first order streams combine to form a second order stream. Two second order streams combine to form a third order, and so forth.

In western Oregon, first and second order streams constitute 79 percent of the total stream mileage (Boehne and House 1983). Such streams rise in very small watersheds with limited water storage capacity. These streams may have only scanty or intermittent flow during the dry season, but during high flows they may move large amounts of sediment and woody debris. The condition of headwater streams mainly determine the type and quality of downstream fish habitat.

First and second order streams are influenced by the geomorphology, soils, and vegetation of their channels. Large woody debris is common, covering as much as 50 percent of the channel (Anderson and Sedell 1979; Swanson and Lienkaemper 1978; Triska et al. 1982). The stream is continuously shaded by vegetation. Flow energy in the channel is continually dissipated by woody material and vegetation that slow erosion and foster deposition of organic and inorganic materials. The average gradient of these streams often exceeds 10 percent, but the channels usually have a stairstep configuration of flat reaches connected by riffles and low falls. Salmonoid reproduction may be sufficient, even in some ephemeral streams, to furnish fry to larger waters downstream (Everest 1973, Everest et al. 1985).

Third and fourth order streams usually flow continuously. The vegetative canopy varies in density. Woody debris usually covers less than 25 percent of the channel. High flows may flush woody material from the system or deposit it in debris jams. These streams can transport large amounts of sediments, which are often deposited around channel obstructions; in narrow, winding areas; or in other areas of low velocity, such as accretion bars, estuaries, and the flood plain. Average gradient is less than five percent, but there may be intermittent stretches of rapids or falls.

The direct influence of riparian areas is moderated in fifth order and larger streams but remains important. Canopies of large, old growth trees provide some shade, vegetated riparian zones keep the main channel confined, and the largest stems of down trees that remain in the stream provide important summer and winter salmonoid habitat. Flood plains of the larger streams contain complex arrays of side channels, overflow channels, and isolated pools. Side channels are often created and maintained by large woody debris (Bisson et al. 1987; Sedell et al. 1984). The gradient in large streams is usually less than one percent, but rapids and falls may occur. Alluvial material and woody debris may be deposited in quiet areas, but accumulations are flushed and rearranged during high flows (Sedell et al. 1988).

Riparian Areas

Riparian areas are critical to the regulation of stream flow and to water quality protection. See the Riparian sections of Chapters 3 and 4 for a discussion of riparian conditions and impacts.

Geomorphic and Hydrologic Function

Stream riparian areas have important geomorphic and hydrologic roles that support their high level of biological productivity. The most productive stream riparian areas are often associated with alluvial stream systems, meaning they are deposition zones which occur in fluvial sediments transported and reworked by the stream. A major role of the riparian area is to function as a flood plain and dissipate stream energies associated with high flows. This process permits sediments to deposit and continue development of the alluvial valley floor.

Alluvial riparian areas also function as shallow aquifers that recharge at high flows and drain at low flows. This interaction between surface flows and ground water storage results in moderated high flows and enhanced or prolonged base flows. The shallow aquifer condition also creates the moist soil conditions required for plant growth and which characterize riparian areas.

The geomorphic and hydrologic characteristics of riparian areas that establish the basic components of biological habitat, including wet soils and instream structural features such as pools, riffles, gravels and stream banks. The vegetation that thrives in riparian areas contributes to their proper geomorphic and hydrologic functioning. Disruption of normal geomorphic or hydrologic function, or the vegetation on which it depends, usually results in impairment of overall riparian resource values.

Geomorphic structure, such as pools and flood plains, strongly influence stream and riparian ecosystems. This is particularly true in steep, mountain valley floors typical of the Coast Range and west slope of the Cascades where floods and debris flows can damage riparian vegetation and alter aquatic habitat on a frequency of years to decades.

The frequency and extent of disturbance, accessibility of riparian areas for wildlife, and magnitude of vegetation influence on stream ecosystems varies with the function of drainage areas and the associated variables of stream channel and valley floor widths. Another important source of structural variability along streams is exogenous (nonfluvial) factors such as bedrock outcrops and large hillslope landslides. Areas of very narrow valley floors can occur along headwater channels in V-shaped valleys or in bedrock or landslide controlled gorges along larger channels. Such areas may have extensive topographic shading, little opportunity for resetting of riparian vegetation by floods, little riparian habitat, and the environmental gradients for terrestrial wildlife are abrupt. In wider valley floors, on the other hand, channels can move laterally, creating complex mosaics of vegetation and secondary channels which are rich aquatic and terrestrial habitat. If only fluvial processes have formed valley floor landforms and there has been no significant influence or variation in bedrock hardness, hillslope landslides, and other exogenous factors, then the valley floor and channel widths are likely to increase uniformly in the downstream direction. Channel and valley floor conditions may vary greatly from one geologic terrain to another (Hansen et al. 1988).

A buffer zone of 2.5 to 3 tree heights (approximately 400-500 feet) is required to protect streamside riparian zones from changes in microclimate and wind damage that can threaten the integrity of vegetative structure and species composition. Microclimate impacts to riparian zones include not only increased water temperature caused by solar radiation, but higher water temperatures due to elevated air temperature and water surface contact. Convection water temperature increases of up to 20° F have been documented in western Oregon (Levno and Rothacher 1967). Another microclimate change is compositional changes in vegetative species caused by reduced humidity. Such changes can alter allochthonous sources for a food chain based on decaying leaves and benthic invertebrates. An end result of these changes is the potential for impacts to fisheries.

Subterranean invertebrates thrive in a maze of underground channels that flow among the gravels, sands and rock that underlie many streams and rivers. These underground waterways can be as deep as 30 feet and can extend laterally for miles from the stream channel.

This understream area, called the hyporheic zone, supports many types of small blind shrimp, primitive worms, bacteria, algae, and various kinds of immature insects. These underground animals in turn support a food chain that extends to the surface. The hyporheic zone serves as a refuge for creatures during times of drought or stress; and, after floods, streams may rely on the life underground to assist in repopulation of aquatic invertebrates. The underground system is rich in bacteria that fix nitrogen, which is in great demand by surface organisms.

Timber management activities (road construction, timber harvest and slash disposal) remove riparian vegetation, constrain natural stream channels, and alter stream banks and channel structure at stream crossings.

Debris torrents, sometimes caused by clearcut timber harvesting techniques and/or road construction in very steep terrain, scour streambeds down to bedrock, damage riparian vegetation, and eliminate the ability of riparian areas to store water and function as shallow aquifers. Harvesting of timber sometimes necessitates the yarding of logs through riparian areas which can cause damage to riparian vegetation and stream banks. (See Animals and Vegetation Sections for more details concerning riparian areas.)

Ground Water

Water that infiltrates the soil surface is known as ground water. Most ground water eventually discharges into stream channels. Ground water is found in layers called aquifers, which are water bearing rocks or sediments that occur at depths from a few feet to several hundred feet below the surface. Aquifers are classified as unconfined or confined. Unconfined aquifers, also known as water table aquifers, are generally shallow with an impermeable layer of rock or soil defining the lower boundary and the water table (saturated zone) located between the impermeable layer and land surface. These shallow, unconfined aquifers are prone to contamination from surface pollutants. Confined aquifers (also known as artesian aquifers) are very deep below the soil surface and are separated from the surface by an impermeable layer of rock or soil. The quality of water in confined aquifers is generally excellent. In some cases, however, chemicals in the subsurface geologic formations can add undesirable contaminants such as arsenic, boron, or sodium.

Ground water is replenished by rain and snow, which filters through soil and geologic formations. This underground water generally moves slowly from mountains and uplands to lowlands and valleys, where it is discharged to creeks, rivers, and marshes. Ground water dischargers to surface waters provide the base flow for streams throughout Oregon. This discharge may vary significantly in different areas, depending on the nature of the aquifer.

Water tables generally rise after removal of vegetation due to increased water (from reduced transpiration) recharging ground water areas. However, reductions in ground water may occur when subsurface flow is intercepted by road cuts and transformed into surface water through a ditch-culvert system. Some intercepted water is deposited on undisturbed soil areas, subsequently returning to subsurface flow. The remainder is deposited into channels and becomes streamflow.

Appendix III-C

Analytical Watersheds in Coos Bay District

Watershed Name	Analytical Watershed Acreage	% BLM	Stream Order	Total Stream Miles [1]	BLM Stream Miles
Lower Smith River	187,681	34	1&2	1,002	330
			3	130	49
			4	82	32
			5	39	12
			6+	63	16
Lower Umpqua Frontal	109,157	15	1&2	326	81
			3	43	13
			4	23	9
			5	19	2
			6+	17	0
Loon Lake-Camp Creek	84,652	29	1&2	313	127
			3	56	23
			4	25	7
			5	22	5
			6+	19	1
Middle Umpqua Frontal	51,593	32	1&2	284	70
			3	36	12
			4	19	4
			5	13	2
			6+	37	0
Siltcoos Frontal	78,891	1	1&2	77	10
			3	7	1
			4	5	0
			5	3	0
			6+	0	0
Lakeside Frontal	62,388	< 1	1&2	0	0
			3	0	0
			4	0	0
			5	0	0
			6+	0	0
Coos Bay North	67,107	2	1&2	77	6
			3	9	1
			4	7	0
			5	1	0
			6+	5	0
Coos Bay South	91,203	4	1&2	192	36
			3	29	6
			4	16	2
			5	5	0
			6+	10	0

Watershed Name	Analytical Watershed Acreage	% BLM	Stream Order	Total Stream Miles[1]	BLM Stream Miles
Millicoma River	96,430	0	1&2	21	0
			3	4	0
			4	2	0
			5	0	0
			6+	2	0
South Fork Coos	158,066	20	1&2	955	239
			3	128	32
			4	63	17
			5	27	4
			6+	56	8
Lower Coquille	61,613	< 1	1&2	22	3
			3	4	0
			4	4	0
			5	0	0
			6+	0	0
Middle Main Coquille	66,146	3	1&2	277	19
			3	34	3
			4	26	2
			5	12	0
			6+	8	0
South Fork Coquille	160,022	5	1&2	619	60
			3	63	7
			4	34	5
			5	19	1
			6+	22	0
East Fork Coquille	84,824	55	1&2	768	393
			3	108	55
			4	52	30
			5	31	15
			6+	40	9
Middle Fork Coquille	97,858	32	1&2	1,463	388
			3	219	60
			4	103	23
			5	72	12
			6+	47	4
North Fork Coquille	102,194	37	1&2	680	221
			3	115	38
			4	58	18
			5	27	6
			6+	63	8
New River Frontal	103,079	4	1&2	479	31
			3	67	4
			4	40	1
			5	12	0
			6+	25	4

Watershed Name	Analytical Watershed Acreage	% BLM	Stream Order	Total Stream Miles[1]	BLM Stream Miles
Sixes River	82,347	3	1&2	572	21
			3	63	1
			4	28	1
			5	19	2
			6+	26	2
Elk River	58,542	2	1&2	96	9
			3	12	2
			4	2	0
			5	0	0
			6+	12	0
Humbug-Nesika Frontal	56,828	8	1&2	401	37
			3	56	4
			4	26	2
			5	15	0
			6+	13	0
Lower Rogue	211,276	2	1&2	320	14
			3	30	1
			4	13	0
			5	3	0
			6+	24	0
Lower Illinois	296,781	< 1	1&2	76	0
			3	1	0
			4	0	0
			5	2	0
			6+	1	0
Hunter Creek	28,227	13	1&2	138	23
			3	19	2
			4	9	0
			5	4	1
			6+	11	0
Pistol River	74,864	4	1&2	173	19
			3	20	2
			4	13	0
			5	3	0
			6+	9	0
Cape Ferrelo Frontal	22,197	< 1	1&2	79	0
			3	10	0
			4	0	0
			5	0	0
			6+	0	0
Chetco River	221,711	5	1&2	228	67
			3	32	9
			4	13	3
			5	9	3
			6+	9	0

Watershed Name	Analytical Watershed Acreage	% BLM	Stream Order	Total Stream Miles [1]	BLM Stream Miles
Winchuck River	44,001	0	1&2	0	0
			3	0	0
			4	0	0
			5	0	0
			6+	0	0
Calif. Smith River	60,026	0	1&2	0	0
			3	0	0
			4	0	0
			5	0	0
			6+	0	0

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[1] Miles of stream include all streams within the watershed and within the WODDB Project Area.

Appendix III-D

Table III-D-1. Non-Point Source Pollution Assessment Report [1]

	Turb	LoDO	Temp	Nutr	B\V	Tox	Sol	Sed	Eros	LoFlo	Debr	Struct	Plants	Other	Impairment Rating
Mid Coast Basin															
196 Fiddle Creek	M2			M2				M2	M2			M2			
Umpqua Basin															
1 Smith River				S1				M2				S1			A1
2 Smith River, N FK	M2	M2		M2				M2	M2	M2		M2			
8 Smith River, W FK			M2					M2				M1			
9 Vincent Creek				S1								S1			A1
10 Scare Creek				S1								S1			A1
11 Big Creek				M2								M2			
12 Halfway Creek				M2								M2			
14 Umpqua River		M2								M2					A1
22 Camp Creek				M1								M1			
80 Weatherly Creek	M2			M1					M2			M1			A1
81 Paradise Creek				M1								M1			
174 S Sister Creek				S1								S1			A1
175 Little Paradise Crk				S1								S1			A1
176 Lutsinger Creek				M1								M1			
177 Mehl Creek				S1								S1			A1
South Coast Basin															
138 Coos Bay			M2		S1			M2			M2				
142 Coos River, S FK				M2				M2				M2			A2
153 Williams River				M2				M2				M2			A2
157 Tioga Creek				M1								M1			
158 Daniels Creek	M2							M2	M2						A2

Table III-D-1. Non-Point Source Pollution Assessment Report [1] (Continued)

	Turb	LoDO	Temp	Nutr	B\V	Tox	Sol	Sed	Eros	LoFlo	Debr	Struct	Plants	Other	Impairment Rating
159 Morgan Creek	M2		M2					M2	M2		M2				
164 Coquille River, N FK	M2	M2		M2				M2	M2	M2		M2			A2
165 Coquille River, N FK	M2							M2	M2						A2
166 Coquille River, N FK	M2			M1				M2	M2			M1			A2
167 Coquille River, E FK				M2				M2				M2			
168 Coquille River, E FK				M2				M2				M2			
169 Coquille River, M FK	M2			M2	M2			M2	M2			M2			
170 Coquille River, M FK								M2							
171 Coquille River, S FK	S1	M2		M2	M2			M2	S1	M2		M2			A2
172 Coquille River, S FK		M2		M2						M2		M2			A2
183 Beaver Creek	M2							M2	M2				M2		
189 Dement Creek	M2			M2				M2	M2			M2			
190 Rowland Creek		M2								M2					
191 Baker Creek						M2		M2						M2	
192 Salmon Creek				M2				M2				M2			
South Coast Basin															
193 Rock Creek				M2				M2				M2			
194 Myrtle Creek	S2			M2					S2			M2			A1
195 Rock Creek Trib.				M2								M2			
196 Upper Rock Creek				M2				M2				M2			
197 Big Creek				M2				M2				M2			
198 Sandy Creek				M2								M2			
199 Twelve Mile Creek								M2							
203 Elk Creek						M2		M2						M2	
204 Brummet Creek			M2								M2				
206 Moon Creek				M2								M2			

Appendix III-D

Table III-D-1. Non-Point Source Pollution Assessment Report [1] (Continued)

	Turb	LoDO	Temp	Nutr	B\V	Tox	Sol	Sed	Eros	LoFlo	Debr	Struct	Plants	Other	Impairment Rating
210 New River		S1								S1					A1
213 Sixes River								M2							
215 Euchre Creek		M1						S1		M1					A2
315 Hunter Creek	M2							M2	M2						
322 Chetco River, N FK	M2	M2						M2	M2	M2					
Rogue Basin															
217 Rogue River	M2								M2						
230 Lobster Creek	M2							M2	M2						

Abbreviations used in this table:

Turb - Turbidity
LoDO - Low Dissolved Oxygen
Temp - Elevated or Depressed Water
Nutr - Nutrients
B/V - Bacteria/Viruses
Tox - Toxics
Sol - Objectionable Discoloration, Scum, Oily Slick or Film, Floating Solids
Sed - Sedimentation
Eros - Streambank Erosion
LoFlo - Decreased streamflow
Debr - Excessive Debris Accumulation
Struct - Insufficient Stream Structure
Plants - Excessive Plant Growths
Other - Other (specified in comments)

M1 - Moderate problem, data
M2 - Moderate problem, observation
M3 - Moderate problem, perception
S1 - Severe problem, data
S2 - Severe problem, observation
S3 - Severe problem, perception
A1 - Severe impairment of one or more beneficial uses
A2 - Streams with conflicting reports on beneficial use/impairments

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[1] Source: Oregon State Department of Environmental Quality, Spring 1988

Appendix III-E

Watershed Condition Index Methodology

The Watershed Condition Index (WCI) is a method of rating a watershed's condition. The WCI describes some important natural basin characteristics, precipitation and runoff response, and land management activities occurring within a given watershed. The index represents conditions on whole watersheds, including BLM, private and other agency lands. The index is an indicator of the cumulative effects of all management activities, public and private, for the size of basin evaluated.

The purpose of the WCI in this RMP is to compare the current condition (as of October 1, 1988) in a selected analytical watershed, with future conditions anticipated under each of the seven land management alternatives in the RMP. For the purpose of analysis the following two assumptions were made:

- Future BLM management activities described in the alternatives would occur during the last five years of the 10-year planning period once the RMP is implemented;
- Fifty (50) percent of all private harvestable timber, identified on BLM's "Gross Vegetation" GIS theme as "Heavy Timber," would be cut during this planning decade.

Guidance for assessing conditions and calculating the individual indexes is summarized in the pages to follow.

The individual indexes are comprised of rating elements, which are mathematically combined in formulas and adjusted using a constant (X) to give a rating between 1 and 2. These constants were developed individually for each district. A rating of 1 represents a minimal effect on watershed condition and 2 has the highest effect. Ratings in the mid-range are considered to have a moderate effect. The numeric value has little meaning by itself. Each rating element in a formula is assigned a multiplier which reflects the relative impact of each element on the watershed condition. For example, since a paved road has less impact on watershed condition than a dirt road, the paved road is given a lower weighting and the dirt road is given a higher weighting. These weightings are based on the professional knowledge and judgement of district hydrologists and soil scientists.

The WCIs are gross indicators of current and future watershed conditions. Differences in watershed condition due to individual activities will be analyzed during project planning in the respective environmental assessments.

The formula and rating elements for calculating the watershed condition indexes is:

$$WCI=SDI*VI*SI*RI*MI*KI*AI*DI*PI*FI*LI$$

Where:
WCI = Watershed Condition Index;
SDI = soil disturbance index,
VI = vegetation index,
SI = silvicultural index,
RI = riparian index,
MI = mining index,
KI = soils index,
AI = slope/aspect index,
DI = drainage density index,
PI = precipitation index,
FI = flow index, and
LI = landslide index.

The product of all rating indexes is the watershed condition index.

Individual Index Calculations

Soil Disturbance Rating Method: Soil disturbance is rated by calculating the acres of roads (by surface type), skid trails, and other areas of soil disturbance. The data was collected by a photo inventory, using 1986 1:12000 scale district photography of the selected analytical watersheds and through WODDB(GIS) records. The formula for the soil disturbance index (SDI) is:

$$SDI=1+[(P+3R+6D+8S+3O)/W*X]$$

Where:

P = paved roads (acres)
D = dirt roads (acres)
O = other disturbances eg. rock pits (acres)
X = constant (2.1)
R = rocked roads (acres)
S = skid trails (acres)
W = watershed size (acres)

Vegetation Type Rating Method: Each vegetation type is given a weighting based on its potential impact on the watershed condition and water quality. The acreage of each current vegetation type was estimated through a photo inventory using 1:12000 scale district photography of the selected analytical watersheds. The acres assigned to the age class of partially cut lands are calculated as the area cut multiplied by the percent of volume cut. The formula used to calculate the vegetation index (VI) is:

$$VI=1+[(6M+3P+10D+7FO{:}0\text{-}3+5FO{:}4\text{-}8+3FO{:}9\text{-}12+FO{:}13\text{-}20+7C)/W*X]$$

Where:

VI = vegetation index
P = pasture or permanent brush (acres)
FO:0-3...= forest, age class (acres)
C = area to be harvested in the 10-year period (acres) by alternative
X = constant (.7)
M = meadow (grass) (acres)
D = disturbed >20% bare soil (acres)
W = watershed size (acres)

Silvicultural Practices Rating Method: Five silvicultural practices that can affect water quality have been identified in the rating. A variety of sources were used including a photo inventory using 1986 1:12000 scale photography of the selected analytical watersheds, from WODDB (GIS) records, through Oregon State Department of Forestry forest practices reports and from the resource area silviculturist's knowledge and records. The formula used to calculate the silvicultural index (SI) is:

$$SI=1+[(10T+5B+3H+2F+P)/W*X]$$

Where:

T = tractor piling (acres piled in the past 20 years)
B = burning (acres burned in the past 1-2 years)
F = Fertilization (acres)
H = herbicides (acres treated with herbicides in the past year)
P = PCT (acres thinned in the past 5 years)
W = watershed size (acres)
X = constant (2.4)

Riparian Rating Method: Riparian areas are classified through a photo inventory using 1986 1:12000 scale aerial photography of the selected analytical watersheds. Total acres of each riparian type are projected from total riparian acres by stream order identified in WODDB. The formula used to calculate the riparian index (RI) is:

$$RI=1+[(9BG+7S+5P+3T+L)/R*X]$$

Where:

BG = bare ground
P = pole sized timber
L = large saw timber
X = constant (.1)
S = seedlings or saplings
T = small saw timber
R = total acres of riparian zones

Mining Rating Method: Mining is rated by the number of operation notices for placer, and sand and gravel mining. Only existing notices are considered unless future plans are known. The formula used to calculate the mining index (MI) is:

$$MI=1+[(N/M)*X]$$

Where:

N = number of notices
X = constant (25)
M = miles of stream

Soils Rating Method: Soils are rated by using the K factor from the Universal Soil Loss Equation. The formula used to calculate the soils index (KI) is

$$KI = 1+[(S1xK1+S2xK2...)/W*X]$$

Where:

S1, S2 = acres of each soil series in the watershed

K1, K2 = k numbers
W = watershed size (acres)
X = constant (3.1)

Slope Aspect Rating Method: The slope is calculated using WODDB GIS and the USGS digitized topography map at a scale of 1:250,000. Using the topography map at this scale identifies those areas with long slopes having substantial changes in elevation. The critical slopes are identified through the TPCC mapping on BLM lands of excessively steep non-suitable woodlands, and logging restricted lands. The TPCC categories included in the critical slope factor are FGNW (non-suitable woodlands where slopes are greater than 80 percent), and FGR2 (fragile gradient lands open to harvest where slopes are greater than 80 percent). The formula used to calculate slope index (AI) is:

$$AI = 1+[((S/W)+(A/WB))*X]$$

Where:
S = area > 60 percent slope (acres)
A = area of critical slopes (FGNW & FGR2)
W = watershed size (acres)
WB = BLM ownership within watershed (acres)
X = constant (1.45)

Drainage Density Rating Method: Drainage density is calculated using the National Handbook of Recommended Methods for Water Data Acquisition. The formula used to calculate the drainage density index (DI) is:

$$DI = 1+(DD*X)$$

Where:
DD = drainage density (miles/square mile)
X = constant (.09)

Precipitation Rating Method: Two-year, 24-hour precipitation amounts are used to calculate the precipitation index. This is the amount of precipitation that has a 50 percent chance of falling in a given year over a 24-hour period. Precipitation depths were taken from the NOAA Climatological Atlas for the Western United States. Because precipitation is strongly elevation-dependent in the Coast Range, each selected watershed had tabulations for several different precipitation depths. The formula used to calculate the precipitation index (PI) is:

$$PI = 1+(P*X)$$

Where:
P = the average two-year, 24-hour storm in the watershed.
X = constant (.11)

Flow Rating Method: Flow is obtained by using the USGS basin characteristics method, using regional runoff equations of predicting a two-year 24-hour magnitude flood and displayed in units of cubic feet per second per square mile (cfs/sq.mi.). This is the instantaneous peak discharge. The formula used to calculate the flow index (FI) is:

$$FI = 1+(Q*X)$$

Where:
Q = two-year 24-hour flood (cubic feet per second/square mile)
X = constant (.007)

Landslide Rating Method: Slope stability is determined by rating each soil series as either stable or nonstable. The stability index is calculated from the percent of the basin that is unstable. The formula used to calculate slope stability (LI) is:

$$LI=1+[((W-U)+(U*9))/W*X]$$

Where:
U = area of unstable soils (acres)   W = watershed size (acres)
X = constant (.058)

Current Watershed Condition

The current watershed condition for the selected analytical watersheds, as determined through the use of the WCI (see Tables at the end of this appendix), is explained on the following pages. Each WCI's individual indexes serve as indicators of potential management problems and opportunities within watersheds.

Selected analytical watersheds in the Umpqua basin, in portions of Lane, Douglas, and Coos counties are Lower Smith River, Middle Umpqua Frontal and Loon Lake/Camp Creek. These watersheds are in poor condition, and the worst overall condition of any group in the district. The WCIs vary from 59 (Lower Smith River) to 122 (Middle Umpqua Frontal).

Key concerns in this grouping of watersheds are:

- Very high percentage of most of these watersheds with steep critical slopes, erodible soils and mapped unstable soils.
- High amount of these watersheds with streamside riparian zones that are predominately young timber, brush or other openings. The lack of established riparian vegetation does not provide erosion protection, shading, streambank stability and structure for current and future aquatic needs.
- High amount of burning, herbicide use, fertilization and pre-commercial thinning in the Lower Smith River watershed. These silvicultural practices can have some effect on water quality.
- High density of rocked and dirt roads and logging disturbances in the Middle Umpqua Frontal watershed. Roadbuilding, logging and other disturbances increase on-site soil loss, delivery to streams, and stream sedimentation.
- High acreage of the Middle Umpqua Frontal analytical watershed that is in acres of meadows, pastures, brush, young forests and areas with over 20 percent exposed soils. These conditions make the watershed highly susceptible to erosive forces in terms of rain splash, overland flow from roads, and other compacted surfaces and landsliding.
- Sand and gravel mining in the floodplain of the Umpqua River within the Middle Umpqua Frontal watershed. These operations can modify stream hydraulics, causing streambed and bank adjustments and sedimentation.

Selected analytical watersheds in the South Coast basin in portions of Coos and Douglas counties are South Fork Coos, North Fork Coquille, East Fork Coquille and Middle Fork Coquille. The South Fork Coos analytical watershed is in poor condition, and the East and Middle Fork Coquille analytical watersheds are in fair condition. The North Fork Coquille analytical watershed is in fair to good condition overall. The WCIs vary from 35 (North Fork Coquille) to 61 (South Fork Coos).

Key concerns in the South Fork Coos analytical watershed are:

- Very high percentage of this watershed with mapped unstable soils.
- Very high percentage of this watershed with critical slopes over 80 percent.
- High acreage of this watershed in young forest age classes. This condition makes the watershed highly susceptible to erosive forces in terms of rain splash, overland flow from roads and other compacted surfaces, and landsliding.
- High amount of the watershed with riparian zones that are predominately young timber, brush or other openings. The lack of established riparian vegetation does not provide adequate erosion protection, shading, streambank stability and structure for current and future aquatic needs.

Key concerns in the North, East and Middle Fork Coquille analytical watersheds are:

- Very high percentage of these watersheds with mapped unstable soils.
- High drainage density in these watersheds, which indicates a high potential for erosion and stream sedimentation.
- High acreage Middle and East Fork Coquille watersheds in young forest age classes. This makes the watersheds susceptible to erosive forces in terms of rain splash, overland flow from roads and other compacted surfaces and landsliding.
- High amount of the Middle Fork Coquille watershed with riparian zones that are predominantly young timber, brush or other openings. The lack of established riparian vegetation does not provide adequate erosion protection, shading, streambank stability and structure for current and future aquatic needs.
- High density of rocked and dirt roads and other logging disturbances in the Middle Fork Coquille watershed. Roadbuilding, logging and other disturbances increase on-site soil loss, delivery to streams and stream sedimentation.

The watershed condition of the selected analytical watersheds is consistent with the Oregon Statewide Department of Environmental Quality 1988 NPS Assessment Report. The Watershed condition index evaluated mainly inherent watershed factors and status of forest management activities on BLM- administered lands and associated private lands. The analytical watersheds are subdivisions of the State NPS basins, and tend to occupy headwater positions above the influence of downstream NPS pollution sources. Consistency with the Oregon NPS Assessment Report and BLM analytical WCIs is discussed in the following section by state basin:

The Lower Smith River, Loon Lake/Camp Creek and Middle Umpqua Frontal analytical watersheds involve only 11 percent of the Umpqua basin. The NPS Assessment Report indicates that portions of the Smith River have moderate to severe stream problem ratings due to sediment, nutrients and lack of stream structure. The WCI for Lower Smith River analytical watershed indicates the stream and watershed are in poor hydrologic condition. The only Umpqua River segment evaluated was in the Middle Umpqua Frontal analytical watershed. The WCI in this watershed was the highest of the selected analytical watershed, and includes acreage from agricultural lands and associated runoff and nutrient sources affecting water quality.

The South Fork Coos analytical watershed is shown to have moderate to serious stream pollution in the NPS Assessment Report, due to lack of stream structure and sedimentation. This compares favorably with the WCI evaluation, where a poor stream and watershed condition was indicated.

The Coquille basin in the NPS Assessment Report shows moderate to severe stream problem ratings. The Middle Fork Coquille analytical watershed starts at Myrtle Point, above the influences of most agricultural lands and point source outfalls from the sewage treatment plants for Myrtle Point, Powers, Coquille and Bandon. Water quality concerns in the Middle Main Coquille and Lower Coquille such as sediment or nutrients from agricultural lands, or low dissolved oxygen, high nutrient loading, bacteria and viruses from sewage treatment sources are not evaluated in the WCI index, since these contributions occur below the analytical watershed boundary. The fair condition for the Middle Fork and East Fork Coquille analytical watersheds, and the fair-good condition for the North Fork Coquille analytical watershed compares favorably with the NPS Assessment Report information for those portions of the Coquille basin.

TABLE III-E-1. **Lower Smith River**

SOIL DISTRUBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	702.12
ROCK ROADS	5.45	3220.71
DIRT ROADS	5.45	1872.69
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL	POINTS=	2520
LOG. TR	0.25	5
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	93
LOG 1 END	0.03	75
SDI=		1.32

VEGETATION	INDEX
	(ACRES)
GRASS	222
BRUSH	144
> 20% BARE SOIL	62
FOREST	
0-3 YRS.	7746
3-8 YRS.	4544
8-12 YRS.	5848
12-20 YRS.	21124
AC. TO BE CUT	0
PRESENT VI=	1.44

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	133
BURNING	2975
HERBICIDES	9597
FERTILIZATION	5154
PRE COMMERCIAL THINNING	20313
SI=	1.97

RIPARIAN	INDEX
RATING	(ACRES)
1	353
2	2020
3	3710
4	2404
TOTAL=	8487
RI=	1.51

MINING	INDEX
NOTICES #	0
DOGAMI PERMITS	
SAND & GRAVEL	0
GOLD & SILVER	0
TOTAL STREAM MILES=	1451
MI=	1.00

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	144060	0.12
K FACTOR	0	0.14
K FACTOR	2784	0.16
K FACTOR	6214	0.21
K FACTOR	7516	0.23
K FACTOR	26986	0.28
KI=		1.47

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	1514
CRITICAL >80%	49687
AI=	1.40

DRAINAGE DENSITY	INDEX
STREAM MI	
WODDB	1316
WATERSHED	1451
DI=	1.45

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	0
4.00	0
4.50	95521
5.00	92160
5.50	
PI=	1.52

FLOW	INDEX
	(CFSM)
2-YR FLOOD	79
FI=	1.55

LANDSLIDE	INDEX
RATING	(ACRES)
1	7516
2	180044
LI=	1.50

WATERSHED SIZE (AC)=	187681.00
BLM AREA (AC)=	63635.00
WODDB (AC)=	170274.00

WATERSHED CONDITION	59.34

TABLE III-E-2. **Middle Umpqua Frontal**

SOIL DISTURBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	114.05
ROCK ROADS	5.45	1495.64
DIRT ROADS	5.45	1106.47
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL POINTS=		1680
LOG. TR	0.25	20
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	256
LOG 1 END	0.03	117
SDI=		1.77

VEGETATION	INDEX
	(ACRES)
GRASS	1175
BRUSH	88
> 20% BARE SOIL	346
FOREST	
0-3 YRS.	5009
4-8 YRS.	2427
9-12 YRS.	2911
13-20 YRS.	4774
AC. TO BE CUT	0
PRESENT VI=	1.97

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	15
BURNING	1502
HERBICIDES	177
FERTILIZATION	350
PRE COMMERCIAL THINNING	1255
SI=	1.47

RIPARIAN	INDEX
RATING	(ACRES)
1	107
2	143
3	499
4	297
TOTAL=	1046
RI=	1.51

MINING	INDEX
NOTICES #	0
DOGAMI PERMITS	
SAND & GRAVEL	3
GOLD & SILVER	0
TOTAL STREAM MILES=	389
MI=	1.19

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	6646	0.12
K FACTOR	39313	0.21
K FACTOR	5462	0.24
K FACTOR	172	0.28
KI=		1.63

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	424
CRITICAL >80%	31734
AI=	1.90

DRAINAGE DENSITY	INDEX
STREAM MI	
WODDB	389
WATERSHED	389.17
DI=	1.43

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	0
4.00	28553
4.50	23040
5.00	0
5.50	0
PI=	1.46

FLOW	INDEX
	(CFSM)
2-YR FLOOD	54
FI=	1.38

LANDSLIDE	INDEX
RATING	(ACRES)
1	5462
2	46146
LI=	1.47

WATERSHED SIZE (AC)=	51593.00
BLM AREA (AC)=	16489.00
WODDB (AC)=	51571.00

WATERSHED CONDITION	122.31

TABLE III-E-3. **Loon Lake Camp Creek**

SOIL DISTURBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	462.60
ROCK ROADS	5.45	1668.98
DIRT ROADS	5.45	1024.63
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL POINTS=		1680
LOG. TR	0.25	24
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	146
LOG 1 END	0.03	89
SDI=		1.51

VEGETATION	INDEX
	(ACRES)
GRASS	458
BRUSH	37
> 20% BARE SOIL	387
FOREST	
0-3 YRS.	3406
4-8 YRS.	3315
9-12 YRS.	2877
13-20 YRS.	6256
AC. TO BE CUT	0
PRESENT VI=	1.51

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	26
BURNING	1939
HERBICIDES	304
FERTILIZATION	584
PRE COMMERCIAL THINNING	4289
SI=	1.46

RIPARIAN	INDEX
RATING	(ACRES)
1	90
2	1080
3	993
4	594
TOTAL=	2757
RI=	1.55

MINING	INDEX
NOTICES #	0
DOGAMI	
SAND & GRAVEL	0
GOLD & SILVER	0
TOTAL STREAM MILES=	627
MI=	1.00

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	16878	0.12
K FACTOR	0	0.14
K FACTOR	0	0.16
K FACTOR	67614	0.21
K FACTOR	130	0.28
KI=		1.60

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	1149
CRITICAL >80%	22647
AI=	1.41

DRAINAGE DENSITY	INDEX
STREAM MI	
WODDB	435
WATERSHED	627
DI=	1.43

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	0
4.00	0
4.50	0
5.00	84652
5.50	0
PI=	1.55

FLOW	INDEX
	(CFSM)
2-YR FLOOD	81
FI=	1.57

LANDSLIDE	INDEX
RATING	(ACRES)
1	0
2	84622
LI=	1.52

WATERSHED SIZE (AC)=	84651.00
BLM AREA (AC)=	24442.00
WODDB (AC)=	58740.00

WATERSHED CONDITION	61.19

TABLE III-E-4. **South Fork Coos**

SOIL DISTURBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	238.00
ROCK ROADS	5.45	3247.00
DIRT ROADS	5.45	2296.00
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL POINTS=		2520
LOG. TR	0.25	65
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	163
LOG 1 END	0.03	131
SDI=		1.55

VEGETATION	INDEX
	(ACRES)
GRASS	255
BRUSH	11
> 20% BARE SOIL	110
FOREST	
0-3 YRS.	4561
3-8 YRS.	4616
8-12 YRS.	6564
12-20 YRS.	8712
AC. TO BE CUT	0
PRESENT VI=	1.38

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	55
BURNING	3122
HERBICIDES	640
FERTILIZATION	1145
PRE COMMERCIAL THINNING	1797
SI=	1.34

RIPARIAN	INDEX
RATING	(ACRES)
1	618
2	2505
3	1874
4	1963
TOTAL=	6960
RI=	1.55

MINING	INDEX
NOTICES #	0
DOGAMI PERMITS	
SAND & GRAVEL	1
GOLD & SILVER	0
TOTAL STREAM MILES=	1441
MI=	1.02

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	119674	0.12
K FACTOR	0	0.14
K FACTOR	2784	0.16
K FACTOR	36408	0.21
K FACTOR	1404	0.23
K FACTOR	580	0.28
KI=		1.45

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	3671
CRITICAL >80%	72473
AI=	1.70

DRAINAGE DENSITY	INDEX
STREAM MI	
WODDB	1229
WATERSHED	1440
DI=	1.52

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	0
4.00	0
4.50	46080
5.00	111974
5.50	0
PI=	1.53

FLOW	INDEX
	(CFSM)
2-YR FLOOD	79
FI=	1.55

LANDSLIDE	INDEX
RATING	(ACRES)
1	1404
2	156662
LI=	1.52

WATERSHED SIZE (AC)=	158066.00
BLM AREA (AC)=	31623.00
WODDB (AC)=	134926.00

WATERSHED CONDITION	61.22

TABLE III-E-5. **North Fork Coquille**

SOIL DISTURBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	354.33
ROCK ROADS	5.45	1934.80
DIRT ROADS	5.45	1603.49
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL	POINTS=	1680
LOG. TR	0.25	27
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	32
LOG 1 END	0.03	15
SDI=		1.34

VEGETATION	INDEX
	(ACRES)
GRASS	915
BRUSH	74
> 20% BARE SOIL	32
FOREST	
0-3 YRS.	2515
4-8 YRS.	1983
9-12 YRS.	2672
13-20 YRS.	8754
AC. TO BE CUT	0
PRESENT VI=	1.34

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	28
BURNING	1881
HERBICIDES	327
FERTILIZATION	675
PRE COMMERCIAL THINNING	2259
SI=	1.34

RIPARIAN	INDEX
RATING	(ACRES)
1	0
2	0
3	1045
4	1512
TOTAL=	2557
RI=	1.38

MINING	INDEX
NOTICES #	0
DOGAMI PERMITS	
SAND & GRAVEL	0
GOLD & SILVER	0
TOTAL STREAM MILES=	944
MI=	1.00

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	55000	0.12
K FACTOR	34998	0.21
K FACTOR	90	0.28
K FACTOR	2634	0.30
K FACTOR	9496	0.34
KI=		1.55

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	854
CRITICAL >80%	27613
AI=	1.40

DRAINAGE DENSITY	INDEX
STREAM MI	
WODDB	943
WATERSHED	944
DI=	1.53

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	0
4.00	56115
4.50	46080
5.00	0
5.50	0
PI=	1.47

FLOW	INDEX
	(CFSM)
2-YR FLOOD	88
FI=	1.46

LANDSLIDE	INDEX
RATING	(ACRES)
1	9496
2	92722
LI=	1.48

WATERSHED SIZE (AC)=	102194.00
BLM AREA (AC)=	37391.00
WODDB (AC)=	102099.00

WATERSHED CONDITION	34.92

TABLE III-E-6. **East Fork Coquille**

SOIL DISTURBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	282.00
ROCK ROADS	5.45	1973.00
DIRT ROADS	5.45	1167.00
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL POINTS=		1660
LOG. TR	0.25	45
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	44
LOG 1 END	0.03	18
SDI=		1.48

VEGETATION	INDEX
	(ACRES)
GRASS	657
BRUSH	228
> 20% BARE SOIL	0
FOREST	
0-3 YRS.	3313
4-8 YRS.	3413
9-12 YRS.	3827
13-20 YRS.	6815
AC. TO BE CUT	0
VI=	1.52

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	17
BURNING	1644
HERBICIDES	194
FERTILIZATION	503
PRE COMMERCIAL THINNING	3784
SI=	1.39

RIPARIAN	INDEX
RATING	(ACRES)
1	0
2	662
3	1320
4	2303
TOTAL=	4285
RI=	1.42

MINING	INDEX
NOTICES #	0
DOGAMI PERMITS	
SAND & GRAVEL	1
GOLD & SILVER	0
TOTAL STREAM MILES	999
MI=	1.03

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	77246	0.12
K FACTOR	0	0.14
K FACTOR	0	0.16
K FACTOR	4446	0.21
K FACTOR	3102	0.34
KI=		1.41

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	1655
CRITICAL >80%	23592
AI=	1.43

DRAINAGE DENSITY	INDEX
STREAM MI	999
DI=	1.68

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	0
4.00	23040
4.50	38744
5.00	23040
5.50	0
PI=	1.50

FLOW	INDEX
	(CFSM)
2-YR FLOOD	66
FI=	1.46

LANDSLIDE	INDEX
RATING	(ACRES)
1	3102
2	81692
LI=	1.51

WATERSHED SIZE (AC)=	84824.00
BLM AREA (AC)=	46474.00
WODDB (AC)=	84824.00

WATERSHED CONDITION	51.07

TABLE III-E-7. **Middle Fork Coquille**

SOIL DISTURBANCE		INDEX
	(AC/MI)	(ACRES)
PAVED ROADS	5.45	379.11
ROCK ROADS	5.45	4899.91
DIRT ROADS	5.45	3377.13
(MILES OF LINES)		INTERSECTS
TRACTOR	60.00	0.00
HIGHLEAD	60.00	0.00
TOTAL POINTS=		2520
LOG. TR	0.25	80
LOG+SCAR TR	0.75	0
SCAR	0.33	0
LOG. HI	0.09	131
LOG 1 END	0.03	50
SDI=		1.60

VEGETATION	INDEX
	(ACRES)
GRASS	607
BRUSH	0
> 20% BARE SOIL	33
FOREST	
0-3 YRS.	9868
4-8 YRS.	4532
9-12 YRS.	4130
13-20 YRS.	40327
AC. TO BE CUT	0
PRESENT VI=	1.53

SILVICULTURAL	INDEX
	(ACRES)
TRACTOR PILING	58
BURNING	3669
HERBICIDES	967
FERTILIZATION	1338
PRE COMMERCIAL THINNING	3749
SI=	1.34

RIPARIAN	INDEX
RATING	(ACRES)
1	666
2	2027
3	2716
4	1269
TOTAL=	6678
RI=	1.56

MINING	INDEX
NOTICES #	0
DOGAMI PERMITS	
SAND & GRAVEL	0
GOLD & SILVER	0
TOTAL STREAM MILES=	1904
MI=	1.00

SOILS		INDEX
	(ACRES)	(K)
K FACTOR	144408	0.12
K FACTOR	322	0.16
K FACTOR	1194	0.18
K FACTOR	2124	0.22
	43676	0.26
	5650	0.34
KI=		1.49

SLOPE	INDEX
	(AC)
LONG SLOPE >60%	3084
CRITICAL	34932
AI=	1.28

DRAINAGE DENSITY	INDEX
STREAM MI	
WODDB	1904
WATERSHED	2011
DI=	1.59

PRECIPITATION	INDEX
2YR-24HR (INCHES)	(ACRES)
3.50	23040
4.00	82658
4.50	92160
5.00	0
5.50	0
PI=	1.46

FLOW	INDEX
	(CFSM)
2-YR FLOOD	64
FI=	1.45

LANDSLIDE	INDEX
RATING	(ACRES)
1	15246
2	182128
LI=	1.49

WATERSHED SIZE (AC)=	197858.00
BLM AREA (AC)=	64033.00
WODDB (AC)=	187363.00

WATERSHED CONDITION	48.50

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Reptiles and Amphibians											
Northwestern Salamander		X			X	X		X	X		X
Long-toed Salamander		X			X	X	X	X			
Pacific Giant Salamander		X			X	X		X	X	X	X
Olympic Salamander		X			X						
Clouded Salamander					X	X	X	X			X
California Slender Salamander					X			X	X	X	
Ensatina		X			X		X				X
Dunn's Salamander		X	X(T)		X			X	X	X	
Del Norte Salamander			X(T)								
Siskiyou Mtns. [4] Salamander			X(T)						X	X	

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[1] Primary habitat is breeding, feeding, or resting habitat (Brown 1985).
[2] C = Cliff T = Talus
[3] No primary habitat orientation for listed habitats (Brown 1985)
[4] Occurrence hypothetical but not confirmed in the Coos Bay District

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid- Seral	Late Seral	Mature	Old- Growth	Hardwood Forest
Reptiles and Amphibians											
Western Redback Salamander		X	X(T)		X		X	X	X	X	
Roughskin Newt		X				X	X	X	X	X	X
Western Toad		X			X	X	X				X
Pacific Tree Frog		X			X	X	X	X	X	X	X
Tailed Frog		X			X		X	X	X	X	
Red-legged Frog		X									X
Foothill Yellow-legged Frog		X									
Bullfrog		X									
Western Pond Turtle		X			X	X	X				X
Loggerhead Sea Turtle[4]	X										
Green Sea Turtle[4]	X										
Leatherback Sea Turtle[4]	X										

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Reptiles and Amphibians											
Olive (Pacific) Ridley Sea Turtle[4]	X										
Northern Alligator Lizard					X	X	X				X
Sagebrush Lizard			X(T)		X						
Western Fence Lizard			X		X	X	X				
Western Skink			X(T)		X						X
Rubber Boa					X	X	X				
Racer						X					X
Ringneck Snake		X			X	X	X				X
Gopher Snake											X
Western Aquatic Garter Snake		X									X
Western Terrestrial Garter Snake		X			X						X
Northwestern Garter Snake		X				X					

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Reptiles and Amphibians											
Common Garter Snake	X	X									X
Sharptail Snake[4]		X	X(T)		X						
Western Rattlesnake			X(C)		X						
California Mountain Kingsnake		X			X						
Birds											
Common Loon	X	X									
Pacific Loon	X										
Yellow-billed Loon	X										
Pied-billed Grebe		X									
Horned Grebe	X	X									
Red-necked Grebe	X										
Eared Grebe	X	X									
Clark's Grebe	X	X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Western Grebe	X	X									
Double-crested Cormorant	X	X	X(C)								
Brandt's Cormorant	X		X(C)								
Pelagic Cormorant	X		X(C)								
Brown Pelican	X										
American Bittern	X	X									
Black-crowned Night Heron	X	X									
Green-backed Heron	X	X									
Cattle Egret		X									
Snowy Egret	X	X									
Great Egret	X	X									
Great Blue Heron	X	X							X		
Tundra Swan	X	X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Greater White-fronted Goose	X	X									
Snow Goose	X	X									
Canada Goose	X	X									
"Aleutian" Canada Goose	X	X									
Brandt	X										
Wood Duck		X		X					X	X	
Green-winged Teal	X	X									
Mallard	X	X									
Northern Pintail	X	X									
Blue-winged Teal	X	X									
Cinnamon Teal		X									
Northern Shoveler	X	X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

Species	Special and Unique Habitats					Temperate Coniferous Forest					
	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Gadwall	X	X									
Eurasian Wigeon	X	X									
American Wigeon	X	X									
Canvasback	X	X									
Redhead	X	X									
Ring-necked Duck		X									
Greater Scaup	X	X									
Lesser Scaup	X	X									
Harlequin Duck	X	X						X	X	X	
Oldsquaw	X										

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Black Scoter	X										
Surf Scoter	X										
White-winged Scoter	X										
Common Goldeneye	X	X		X							
Bufflehead	X	X		X					X	X	
Hooded Merganser		X		X					X	X	
Common Merganser	X	X		X					X	X	
Red-breasted Merganser	X	X		X					X	X	
Ruddy Duck	X	X									
Turkey Vulture	X		X(C)			X				X	
Osprey	X	X		X					X	X	

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Black-shouldered Kite		X									
Bald Eagle	X	X		X						X	
Northern Harrier		X									
Sharp-shinned Hawk								X	X	X	
Cooper's Hawk								X	X	X	
Northern Goshawk											
Red-Shouldered Hawk		X									
Red-Tailed Hawk						X				X	X
Rough-legged Hawk		X									
Golden Eagle						X					X
American Kestrel		X		X		X					

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Black-bellied Plover	X	X									
Lesser Golden Plover	X										
Western Snowy Plover	X										
Semipalmated Plover	X	X									
Killdeer	X	X									
Black Oystercatcher	X										
Greater Yellowlegs	X	X									
Lesser Yellowlegs	X	X									
Solitary Sandpiper	X	X									
Willet	X										

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Wandering Tattler	X										
Spotted Sandpiper	X	X									
Merlin	X	X									
Peregrine Falcon	X	X	X(C)								
Gyrfalcon	X										
Ring-necked Pheasant		X									
Blue Grouse						X	X	X	X	X	
Ruffed Grouse		X									X
Wild Turkey											X
California Quail											X
Mountain Quail						X					X
Virginia Rail		X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Sora		X									
American Coot	X	X									
Whimbrel	X										
Long-billed Curlew	X	X									
Bar-Tailed Godwit	X										
Marbled Godwit	X										
Ruddy Turnstone	X										
Black Turnstone	X										
Surfbird	X										
Red Knot	X										
Sanderling	X										
Semipalmated Sandpiper	X	X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Western Sandpiper	X	X									
Least Sandpiper	X	X									
Baird's Sandpiper	X	X									
Pectoral Sandpiper	X	X									
Sharp-tailed Sandpiper		X									
Rock Sandpiper	X										
Dunlin	X	X									
Stilt Sandpiper	X										
Buff-breasted Sandpiper	X	X									
Ruff	X										
Short-billed Dowitcher	X										

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Long-billed Dowitcher	X	X									
Common Snipe	X	X									
Red-necked Phalarope	X										
Red Phalarope	X										
Wilson's Phalarope	X	X									
Bonaparte's Gull	X	X									
Heermann's Gull	X										
Mew-Gull	X	X									
Ring-billed Gull	X	X									
California Gull	X	X									
Herring Gull	X	X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	**Coastal**	**Riparian Wetland**	**Cliffs/ Talus (C,T)[2]**	**Snags**	**Dead/ Down**	**Early Seral**	**Mid-Seral**	**Late Seral**	**Mature**	**Old-Growth**	**Hardwood Forest**
Birds											
Thayer's Gull	X										
Western Gull	X										
Glaucous-winged Gull	X										
Glaucous Gull	X										
Black-Legged kittiwake	X										
Sabine's Gull	X										
Caspian Tern	X										
Common Tern	X	X									
Arctic Tern	X										
Common Murre	X										
Pigeon Guillemot	X										
Marbled Murrelet	X									X	

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Ancient Murrelet	X										
Cassin's Auklet	X										
Rhinoceros Auklet	X										
Tufted Puffin	X										
Rock Dove	X		X(C)								
Band-tailed Pigeon	X	X									X
Mourning Dove		X									
Common Barn-owl				X		X					X
Western Screech-owl		X		X							
Great Horned Owl		X				X			X	X	X
Snowy Owl	X	X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Northern Pygmy-owl				X					X	X	
Northern Spotted Owl				X					X	X	
Barred Owl				X					X	X	
Short-eared Owl		X									
Northern Saw-whet Owl						X			X	X	X
Common Nighthawk	X	X	X(T)			X					X
Black Swift			X(C)								
Vaux's Swift		X		X		X	X			X	
Anna's Hummingbird											X
Rufous Hummingbird		X				X	X		X		X

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Allen's Hummingbird						X	X				X
Belted Kingfisher	X	X	X(C)	X							
Lewis' Woodpecker				X	X						
Acorn Woodpecker				X							X
Red-breasted Sapsucker		X									
Downy Woodpecker		X		X							
Hairy Woodpecker				X	X				X	X	
White-headed Woodpecker				X							
Northern Flicker				X	X	X			X	X	X
Black-backed Woodpecker				X							
Pileated Woodpecker				X	X					X	

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Olive-sided Flycatcher									X	X	
Willow Flycatcher		X									
Hammond's Flycatcher									X	X	
Dusky Flycatcher[3]											
Western Flycatcher										X	X
Black Phoebe	X	X	X(C)								
Tropical Kingbird		X									
Western Kingbird[3]											
Horned Lark	X										
Purple Martin	X	X		X							
Tree Swallow		X		X		X				X	X
Violet-green Swallow		X	X(C)	X							

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Northern Rough-winged Swallow		X	X(C)								
Cliff Swallow			X(C)								
Bank Swallow		X	X(C)								
Barn Swallow	X	X									X
Gray Jay							X	X	X	X	
Steller's Jay							X	X	X	X	
Scrub Jay											X
American Crow	X	X								X	
Common Raven			X(C)			X	X		X	X	X
Black-capped Chickadee		X		X							X
Mountain Chickadee				X							
Chestnut-backed Chickadee				X			X	X	X	X	

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Bushtit											X
Red-breasted Nuthatch				X	X				X	X	
White-breasted Nuthatch				X							
Brown Creeper				X					X	X	
Bewick's Wren					X						X
House Wren				X	X						
Winter Wren					X				X	X	
Marsh Wren		X									
American Dipper	X	X									
Golden-crowned Kinglet								X	X	X	X
Ruby-crowned Kinglet						X	X		X	X	
Western Bluebird				X							

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Townsend's Solitaire			X(C)		X	X	X		X	X	
Swainson's Thrush						X	X	X	X	X	X
Hermit Thrush						X	X		X	X	
American Robin		X				X	X				X
Varied Thrush									X	X	X
Wrentit	X										
Northern Mockingbird	X										
Water Pipit	X	X									
Cedar Waxwing											X
Northern Shrike[3]											
Loggerhead Shrike		X									

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
European Starling				X							X
Solitary Vireo									X	X	
Hutton's Vireo											X
Warbling Vireo											X
Orange-crowned Warbler						X	X				X
Nashville Warbler											X
Yellow Warbler											X
Yellow-rumped Warbler						X	X	X	X	X	X
Black-throated Gray Warbler						X	X	X	X	X	X
Townsend's Warbler									X	X	

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Hermit Warbler								X	X	X	
Palm Warbler		X									X
Black & White Warbler											X
MacGillivray's Warbler		X									
Common Yellowthroat		X									
Wilson's Warbler											X
Yellow-breasted Chat[3]											
Western Tanager						X			X	X	
Black-headed Grosbeak											X
Lazuli Bunting											
Rufous-sided Towhee						X	X				X

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Chipping Sparrow						X	X				X
Vesper Sparrow	X										
Savannah Sparrow		X									
Fox Sparrow											X
Song Sparrow		X									X
Lincoln Sparrow		X									
Golden-crowned Sparrow		X									
White-crowned Sparrow						X					X
Harris' Sparrow[3]											
Dark-eyed Junco						X	X		X	X	X
Lapland Longspur	X										

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

Species	Special and Unique Habitats					Temperate Coniferous Forest					
	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Snow Bunting	X										
Red-winged Blackbird	X	X									
Western Meadowlark[3]											
Yellow-headed Blackbird		X									
Brewer's Blackbird	X	X				X					X
Brown-headed Cowbird		X				X	X				X
Northern Oriole		X									
Purple Finch							X			X	
House Finch[3]											
Pine Siskin		X				X	X	X	X	X	X
Lesser Goldfinch		X									
American Goldfinch											X

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats				Temperate Coniferous Forest						
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Birds											
Evening Grosbeak						X	X	X	X		
House Sparrow[3]											
Mammals											
Virginia Opossum		X		X	X						X
Pacific Water Shrew		X			X						
Pacific Shrew		X			X	X					X
Trowbridge's Shrew	X				X			X	X	X	X
Vagrant Shrew		X				X					
Shrew-mole		X			X			X	X		X
Townsend's Mole		X				X					
Coast Mole		X				X	X				X
Big Brown Bat		X	X(C)	X		X				X	X

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

Species	Special and Unique Habitats					Temperate Coniferous Forest					
	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Mammals											
Hoary Bat		X				X	X		X	X	X
California Bat		X	X(C)	X		X	X	X	X	X	X
Silvery-haired Bat				X			X	X	X	X	X
Long-eared Myotis		X		X					X	X	
Little Brown Myotis		X		X		X	X		X	X	X
Long-legged Myotis		X	X(C)	X							
Yuma Myotis		X	X(C)	X		X			X	X	X
Townsend's Big-eared Bat		X					X				
Coyote		X			X	X	X				X
Gray Fox					X						X
Red Fox		X			X	X					X

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Mammals											
Black Bear		X			X	X	X	X	X	X	X
Ringtail			X(T)								X
Raccoon	X	X		X		X	X	X	X	X	X
River Otter	X	X									
Marten				X	X				X	X	
Fisher			X(T)	X	X				X	X	
Ermine			X(T)		X	X		X	X	X	X
Long-tailed Weasel					X	X	X				X
Mink	X	X			X						
Striped Skunk	X	X									
Spotted Skunk		X			X	X	X				X
Mountain Lion		X	X			X	X		X		
Bobcat		X	X		X	X	X				

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Mammals											
Harbor Seal	X										
Northern Elephant Seal	X										
Steller Sea Lion	X										
California Sea Lion	X										
Black-tailed Deer		X				X	X	X	X		X
Mountain Beaver					X	X	X				X
Northern Flying Squirrel				X					X	X	
Western Gray Squirrel				X							X
California Ground Squirrel[3]											

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid-Seral	Late Seral	Mature	Old-Growth	Hardwood Forest
Mammals											
Townsend's Chipmunk			X(T)		X		X	X	X	X	
Douglas Squirrel				X			X	X	X	X	
Western Pocket Gopher						X					X
Bushy-tailed Woodrat			X		X			X	X	X	X
Dusky-footed Woodrat						X	X	X	X	X	X
Deer Mouse			X(T)		X	X	X				X
Western Harvest Mouse		X									X
White-footed Vole		X			X				X		
Red Tree Vole								X	X	X	
Western Red-backed Vole					X			X	X	X	

Appendix III-F. Wildlife Species and Primary Habitat[1] Associations in the Coos Bay District

	Special and Unique Habitats					Temperate Coniferous Forest					
Species	Coastal	Riparian Wetland	Cliffs/ Talus (C,T)[2]	Snags	Dead/ Down	Early Seral	Mid- Seral	Late Seral	Mature	Old- Growth	Hardwood Forest
Mammals											
Creeping Vole		X			X	X	X				X
Townsend's Vole		X				X					
Muskrat		X									
House Mouse[3]											
Norway Rat[3]											
Black Rat[3]											
Pacific Jumping Mouse		X				X					X
Porcupine			X(C)		X	X	X	X	X	X	X
Nutria		X									
Brush Rabbit						X	X		X		X
Beaver		X									
Long-tailed Vole		X	X(T)		X	X					

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[1] Primary habitat is breeding, feeding, or resting habitat (after Brown 1985).
[2] C = Cliff T = Talus
[3] No primary habitat orientation for listed habitats (Brown 1985)

Appendix III-G

Fish Species in Coos Bay Planning Area Streams

Nonsalmonid

Western brook lamprey
Pacific lamprey
Green lamprey
Green sturgeon
White sturgeon
American shad
Longfin smelt
Surf smelt
Whitebait smelt
Eulachon
Longfin smelt
Squawfish (*Ptychocheilus* spp.)
Dace (*Rhinichthys* spp.)
Shiners (*Richardsonius* spp.)
Suckers (*Catostomus* spp.)
Bullheads (*Ictalurus* spp.)
Mosquitofish
Threespine stickleback
Striped bass
Sunfishes (*Lepomis* spp.)
Smallmouth bass
Largemouth bass
White crappie
Black crappie
Yellow perch
Sculpins (*Cottus* spp.)

Salmonid

Chum salmon
*Coho salmon
*Chinook salmon
*Cutthroat trout
*Steelhead
Brook trout

* Priority species

Appendix III-F. Wildlife Species and Primary Habitat Associations in the Coos Bay District

		Special and Unique Habitats			Temperate Coniferous Forest						
Species	[illegible]	Riparian Wetland	[illegible]	[illegible]	[illegible]	[illegible]	Mid Seral	Late Seral	Mature	Old Growth	Hardwood Forest
Mammals											
Creeping Vole		X			X	X	X				X
Townsend's Vole		X									
Muskrat		X									
House Mouse[3]											
Norway Rat[3]											
Black Rat[3]											
Pacific Jumping Mouse		X									
Porcupine			[illegible]								
Nutria		X									
[illegible]											
Beaver		X									
Long-tailed Vole		X	[illegible]								

[illegible]
[illegible]
[illegible]

Appendix III-H

Methodology Used in Rating Quality of Stream Habitat

A main element used in rating the quality of stream habitat is riparian tree size. The rationale for using riparian tree size (i.e., dbh) as a rating element is based on research (Sedell et al 1988), inventory data, and field experience of BLM fishery biologists. Data from these sources indicate that vegetative conditions (size of trees) in adjacent riparian areas are directly related to stream habitat quality and fish populations. Trees in riparian areas fall into streams and create desirable habitat conditions. Tree size information in the BLM Operations Inventory was used for making the initial stream habitat quality rating.

Many interrelated physical and biological factors affect the quality of fish habitat and fish populations. A "related factors" analysis was done to determine if any factors beside riparian tree size should be considered in making a final habitat quality rating. Other related factors include the amounts of water diversion, and sediment yield, availability of natural structure, presence of beaver dams or side channels, or presence of rehabilitation structures. Some of these factors are not inventoried for all BLM stream segments. Therefore, the district biologist determined which known factors were most important in making a final habitat rating.

Characteristic stream habitats of the three condition classes are as follows:

1. **Minimal.** Major alterations in watershed or water quality and quantity conditions, natural stream habitat and riparian areas; few or no large trees present in riparian areas with most measuring 0-11" dbh; little or no large woody debris; pools few and shallow; heavy sedimentation of stream bed by sand and silt; stream productivity for aquatic life drastically reduced, fish populations at only 10-25 percent of potential.

2. **Fair.** Watershed moderately impacted by activities; riparian vegetation altered by past events or activities, few large trees present with most measuring 12-21" dbh; physical stream conditions substantially altered from natural conditions because of past or present activities, e.g., limited amount of large woody debris and fine sediments in pools and riffles above natural amounts; some adverse changes in water quality and quantity; habitat either partly recovered or still decreasing in trend; stream moderately productive for aquatic life, but fish populations far below potential (approximately 50 percent).

3. **Good/Optimal.** Watershed either not greatly impacted by activities or mostly recovered and in good condition; riparian areas in good condition with diverse vegetation including large trees over 21" dbh; physical stream conditions only slightly altered with nearly complete recovery or virtually unchanged from natural conditions, e.g., abundant and diverse instream structure including large woody debris, numerous deep pools, bottom substrate relatively free from fine sediments, adequate spawning gravels, and stable banks and channels; water quality and quantity (temperature, turbidity, flow, etc.) generally unaltered from natural conditions; stream highly productive for aquatic life, i.e., producing near or at its potential for salmon, trout, and other native fish.

Appendix III-I
Special Status Species - Animals

Species	Status Federal [1]	Category State [2]
Fish		
Chum Salmon	S	SC
Coho Salmon, South Coast Runs	S	SC
Chinook Salmon, Fall South Coast Runs	S	SC
Millicoma Dace	A	SU
Oregon Chub	E	
Amphibians		
Clouded Salamander	S	SC
Tailed Frog	S	SV
California Slender Salamander	A	SP
Del Norte Salamander	C2	SV
Red-legged Frog	C2	SU
Foothill Yellow-legged Frog	A	SU
Olympic Salamander	S	SV
Siskiyou Mountains Salamander	C2	SV
Reptiles		
Northwestern Pond Turtle	C2	SC
Loggerhead Sea Turtle	T	T
Green Sea Turtle	T	E
Leatherback Sea Turtle	E	E
Olive (Pacific) Ridley Sea Turtle	T	E
Sharptail Snake	S	SC
California Mountain Kingsnake	A	SP
Birds		
Northern Goshawk	C2	
Aleutian Canada Goose	T	E
Long-billed Curlew	C3	
Marbled Murrelet	T	SC
Tricolored Blackbird	C2	SP
Western Snowy Plover	PT	T
Fork-tailed Storm-petrel	S	SV
Pileated Woodpecker	S	SC
Snowy Egret	S	SV
Peregrine Falcon	E	E
Northern Pygmy Owl	A	SU
Bald Eagle	T	T
Bufflehead	A	SP
Harlequin Duck	C2	
Acorn Woodpecker	A	SU
Lewis' Woodpecker	S	SC
Mountain Quail	C2	
Brown Pelican	E	E

Species	Status Federal [1]	Category State [2]
Birds (Continued)		
White-headed Woodpecker	S	SC
Black-backed Woodpecker	S	SC
Purple Martin	S	SC
Western Bluebird	S	SV
Northern Spotted Owl	T	T
Mammals		
Ringtail	A	SU
Pine Marten	S	SC
Fisher	C2	SC
White-footed Vole	C2	SP
Townsend's Big-eared Bat	C2	SC
Steller (Northern) Sea Lion	T	SC
Blue Whale	E	E
Gray Whale	E	E
Hump-back Whale	E	E
Invertebrates		
Burnell's False Water Penny Beetle	C2	
Siskiyou Chloealtis Grasshopper	C2	
Abellan Hydropsyche Caddisfly	C2	
Vertree's Ochrotrichian Micro Caddisfly	C2	
Oregon Pearly Mussel	C2	
Fender's Rhyacophilan Caddisfly	C2	
Siskiyou Caddisfly	C2	
Alsea Micro Caddisfly	C2	

Status

[1] E - Endangered
T - Threatened
P - Proposed
C2 - Candidate
S - Bureau Sensitive
A - Assessment

Category

[2] E - Endangered
T - Threatened
SC - Sensitive Critical
SV - Sensitive Vulnerable
SP - Sensitive Peripheral or Naturally Rare
SU - Undetermined Status

Source: Oregon Natural Heritage Program. (December 1991)

Appendix III-J

Present Condition of Existing and Potential Special Areas

Existing	**Present Condition**
New River ACEC	Most of the open foredunes along New River have been stabilized by the introduction of European beachgrass and establishment of shore pine. Some grazing may have damaged the quality of riparian habitat and introduced exotic grass species. Use of ORVs and motorized boats in the past disturbed nesting shorebirds and migratory waterfowl. The area has now been fenced to control livestock, and closed to ORV use and motorized boats. Plans are also underway to possibly control the spread of beachgrass.
Cherry Creek RNA	A small recreational day-use site and short hiking trail are located on the southwest edge of the RNA. Much of the RNA remains in essentially pristine condition.
Powers Environmental Education Area	This area is a relatively undisturbed stand of Douglas-fir. A small foot trail has been developed through the area providing access for students of the school district on nature studies or classes related to forestry.
Potential	
Wassen Creek ACEC/RNA	Although most of the surrounding area has been logged, the upper Wassen Creek drainage is relatively undisturbed. Numerous natural slumps and landslides have occurred because of the thin, unstable soils typical of this region. Two short logging roads and evidence of recent recreational campsites are the only disturbances at Wassen Lake.
North Fork Coquille River ACEC	Most of the upper portion of the North Fork Coquille drainage has been logged, resulting in increased downstream sedimentation. Road 25-10-30.0 borders the proposed ACEC, and has encouraged repeated entry into the riparian zone for salvage logging.
China Wall ACEC	Although access roads form the eastern and western boundaries of the proposed ACEC, most of the area remains relatively undisturbed. There is some use by elk hunters and mushroom pickers.
Tioga Creek ACEC	The headwaters of Tioga Creek have been extensively logged, resulting in increased sedimentation downstream. Stream habitat was adversely affected by the removal of down logs by salvage logging. During hunting season, this area experiences a considerable amount of use.
North Spit ACEC	Deposition of dredge spoils has impacted several portions of the proposed ACEC. Much of the original dune area has been stabilized by the introduction of European beachgrass. Heavy ORV use along the eastern and western edges of the Spit is destroying populations of federal candidate threatened plants and shorebirds. Recreational use is heavy, especially to the clambeds along the bay side of the North Spit.
Upper Rock Creek ACEC/RNA	Private lands along the west edge of the proposed ACEC have been logged, and an unimproved access road allows for some ORV use. Most of the stand remains essentially undisturbed.

Potential	Present Condition
North Fork Hunter Creek ACEC/RNA	Prairies along the North Fork have traditionally been grazed, allowing for the introduction of exotic species. Some trespass grazing is still taking place. Human use is light, although one trail crossing the area is presently maintained.
Hunter Creek Bog ACEC/RNA	Mining claims cover much of the bog area. Some disturbance has resulted from road building and testing for mineral deposits. Recreational use has created several small trails through the bog.
North Fork Chetco River ACEC/RNA	The headwaters of the North Fork Chetco have been extensively logged, resulting in increased sedimentation and increased water temperatures. BLM access roads form the western and northern boundaries of the ACEC, and some slide material has been placed in a waste area within the riparian zone.

SOURCE: District special area files.

Appendix III-K

Special Areas - Identification and Screening of Canditate ACECs

During the initial 1990s RMP analysis process the public, BLM employees, and other government agencies identified nine areas within the district as possibly meeting ACEC criteria. These candidate areas were then screened for both "importance" and "relevance" criteria by an Interdisciplinary Team (IDT) to determine whether or not these criteria were met. For those areas where ACEC criteria was met, the IDT proposed boundaries and management objectives. These recommendations were presented to the Area Managers for deciding which areas were to be considered as potential ACECs in the RMP, and then forwarded to the District Manager for concurrence. A summary of the ACEC screening results is provided in Table III-K-1.

Table III-K-1. Candidate ACEC Screening Results

Candidate ACEC	Nomination Source	Nomination Acres	Historic, Cultural or Scenic Value	Fish or Wildlife Habitat Value	Natural System, Bot., Geol. Value	Special Status Species	Hazard Area	Meets Relevance Criterion	Meets Importance Criterion	Potential ACEC Acres
Wassen Creek	Nature Conservancy	3,440	N	Y	Y	Y	N	Y	Y	3,440
North Fork Coquille	BLM	290	Y	Y	Y	Y	N	Y	Y	290
China Wall	BLM	240	Y	Y	Y	Y	N	Y	Y	240
Tioga Creek	BLM	40	N	Y	Y	Y	N	Y	Y	40
North Spit	BLM	580	Y	Y	Y	Y	N	Y	Y	580
Upper Rock Creek	Nature Conservancy	460	N	Y	Y	Y	N	Y	Y	460
North Fork Hunter Cr.	Nature Conservancy	1,730	Y	Y	Y	Y	N	Y	Y	1,730
Hunter Creek Bog	Nature Conservancy	570	Y	Y	Y	Y	N	Y	Y	570
North Fork Chetco Riv.	Nature Conservancy	600	Y	Y	Y	Y	N	Y	Y	600

Abbreviations used in this table:
Y = Yes (meets)
N = No (doesn't meet)

SOURCE: District special area files.

Appendix III-L

Cultural Resource Inventory Procedures

Three classes of inventory are included in the BLM's standard nationwide cultural resource program. Class I inventory consists of a review and compilation of existing data into a Cultural Resource Overview document.

Class II inventories are field sampling strategies designed to gather statistically valid data to provide objective estimates of the nature and distribution of cultural resources in a defined study area. Areas selected for a Class II inventory are surveyed at the same intensity as for a Class III inventory.

Class III inventories are intensive field inventories designed to identify and record, from surface and exposed subsurface and profile indications, all cultural resource sites within a specific location. Typically, Class III inventories are used in advance of projects that may cause disturbance or result in the destruction of sites, either by direct or indirect mechanisms. Heavily vegetated, steep, and highly dissected terrain commonly characterize BLM lands in western Oregon, making Class III inventories nearly impractical for pre-project site identification. Therefore, a fourth class of inventory, the reconnaissance inventory, is used specifically in western Oregon in advance of projects with site-disturbing potential when heavy vegetation is present.

The reconnaissance inventory consists of trained individuals walking over lands where there is potential occurrence of cultural resources and viewing the ground surface and/or subsurface as possible, given the dense ground cover. The pedestrian survey techniques may be enhanced by using hand tools to create small openings in the duff layer exposing the mineral soil at selected intervals along the survey transect. The use of reconnaissance inventories in western Oregon has been addressed in the Cooperative Agreement (as modified in 1983) between the Oregon State Historic Preservation Office and the Bureau of Land Management, Oregon State Office.

A Class I overview of all Coos Bay District lands was completed in 1980 and is available at the district office. It has not been updated.

No Class II inventories have been conducted within the Coos Bay District. However, approximately 10,000 acres have been inventoried at the Class III level, using parameters established in the Management Framework Plan of 1983.

Reconnaissance surveys have been performed on timber sale harvest units and tracts identified for land exchange purposes. A total of 60,551 acres of BLM-administered lands has been inventoried using reconnaissance techniques.

The eligibility of some cultural resource sites for inclusion in the National Register of Historic Places has been assessed using criteria established in 36 CFR 60.4.

Appendix III-M

List of All Existing and Potential Special Recreation Management Areas in the Planning Area

(see Wild and Scenic Rivers, Recreation, Special Areas and Wilderness sections in Chapter 3 for additional information).

Wild and Scenic Rivers

Rivers designated by Congress for inclusion in the Federal Wild and Scenic River System would also be designated and managed as SRMAs.

The following rivers have been identified as potential rivers for inclusion in the System: Smith, Umpqua, South Fork Coos, North Fork Coquille, East Fork Coquille, South Fork Coquille, New River, Sixes, South Fork Pistol and North Fork Chetco Rivers, Wassen Creek.

Special Recreation Management Areas

Existing SRMAs have not been formally designated as such. The SRMA-ERMA Classification System did not exist when the district's last Land Use Plan was approved. However, these sites or areas have been managed as SRMAs since the Classification System was established. The following areas and sites have been identified:

Existing - Loon Lake/East Shore Loon Lake.

Dean Creek Elk Viewing Area, North Spit-Coos Bay Shorelands, New River [1]

Potential - Sixes River, Gregory Point.

Wilderness

Existing - Squaw Island.

Potential - North Sisters Rock, Zwagg Island.

Special Areas

Existing - Cherry Creek RNA, New River ACEC [1], Powers Environmental Education Area.

Potential - Wassen Creek, North Spit [1], North Fork Coquille River, Tioga Creek, China Wall, Upper Rock Creek, Hunter Creek Bog, North Fork Hunter Creek, North Fork Chetco River.

[1] Areas with dual designations; ACECs and SRMAs

Existing SRMA Acreage and Visitation

SRMA Name	BLM Acres	1990 Visits	Percent of Total Visitation - Existing SRMAs
Loon Lake Recreation Site/East Shore	134	123,400	19
Dean Creek Elk Viewing Area	1,039	450,000	70
North Spit - Coos Bay Shorelands	1,662	65,500	10
New River Area of Critical Environmental Concern	863	4,000	1
Total	3,698	642,900	100

Source: BLM, Coos Bay District 1990 Recreation Management Information System (RMIS)

Appendix III-N
Forest Inventory

Before alternative land use plans can be developed and considered for forested public lands, information about the land must be available. Some of the most important information needed relates to the ability of the land to grow trees, the location and condition of the trees, and the growth rate and present volume of the trees. The BLM obtains this information primarily through three inventory systems (TPCC, Operations Inventory and Forest Reinventory) which are described in the following sections.

Timber Production Capability Classification (TPCC)

The Timber Production Capability Classification (TPCC) is an intensive inventory process initiated in 1972 to categorize all public land administered by BLM in western Oregon based upon the land's physical and biological capacity to produce timber. TPCC was conducted in accordance with Oregon Manual Supplement 5250 and the Coos Bay District Supplement.

The 1977 TPCC identified commercial forest land which could be managed on a sustained yield basis. This land formed the potential timber production base for computation of the annual allowable harvest. Approximately 287,000 acres were identified in this category. The TPCC also identified about 22,000 acres of commercial forest land that was determined to be incapable of undergoing harvest without significant site degradation. This land was not included in the potential timber production base. Sites were placed in this category only when economically reasonable technology was not considered available to mitigate possible degradation. The remainder of the district's 326,000 acres (17,000 acres) were determined to be non-forest or non-commercial forest.

In 1986 the Oregon State Office issued Handbook 5251-1 Timber Production Capability Classification, which replaced the 1972 Manual Supplement utilized in 1977. Table 3-T-1 displays how district lands were subdivided in the 1988 TPCC inventory.

The land base used for computation of potential allowable sale quantities (ASQ) utilizing the two TPCC systems are not directly comparable. The 1986 system contains two woodland classifications which did not exist in 1977. Each of the woodland categories could be components of the ASQ. By contrast, the 1977 system by definition withdrew from planned harvest those lands classified as low site and non-commercial species.

In addition to the differences in the two systems, the district land base changed as a result of land exchanges and revocations of withdrawals previously administered by the Corp of Engineers on the North Spit of Coos Bay.

The TPCC Handbook is available for inspection during normal working hours at the District Office, and provides a complete description of the classifications.

Operations Inventory

For BLM to carry out the timber management program effectively, specific information as to the location and current condition of the various forest types within the land base must be available to the managers. This is accomplished through the Operations Inventory (OI) in accordance with procedures contained in the Operations Inventory Handbook.

The OI is an intensive inventory which divides the forests into survey units sufficiently uniform in composition, condition, operability, productivity, or other characteristics to distinguish them from adjacent units. Information on each unit is maintained in the MICRO*STORMS computer inventory system. Each survey unit has information on location, acreage, stand condition, past management, silvicultural needs and opportunities for application of intensive management practices.

Forest Reinventory

Extensive Inventory (5-point)

The purpose of the extensive inventory is to determine the existing volume in the district. A reinventory of commercial forest land was completed in 1988 employing procedures jointly developed by the USFS and BLM. The reinventory used the same basic inventory design used for preparation of the present management plan. The inventory is a stratified random sample of the commercial forest land base. Each plot is a cluster of five sample points. Each point is the center of both a fixed and variable radius plot.

The objective of the inventory is to estimate the total coniferous volume within a range of plus or minus ten percent (two standard deviations). Statistical analysis (based on measurements of 308 plots) indicates that the total conifer volume estimates for merchantable strata on the district is within 9.6 percent.

The volume on present stands is derived from 363 permanent, continuous forest inventory plots. The majority of these plots were established in 1968, remeasured in 1978 and again in 1988. Additional plots were established in 1978 and 1981 to increase the sample of second growth and precommercially thinned stands. Inventory plots are stratified based on site index, age and major TPCC type (Suitable Commercial Forest Land, Suitable Woodland, Non-Suitable Woodland and Non-forest and Recreation sites).

More information on forest inventory procedures is available from the district office.

Appendix IV

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IV-C Ten-Year Mineral Development Scenario
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Appendix IV-A

Sensitivity Analysis

Sensitivity analysis is a process of identifying specific trade-offs and opportunity costs associated with differing approaches to land-use allocations and other decision elements. It examines possible changes in single elements of an alternative. Such analyses can help design a preferred alternative that best reconciles potential conflicts and optimize overall benefits. Because of the number of land-use allocation issues and plan alternatives, BLM found it essential to limit and tightly focus the sensitivity analyses on the most sensitive or controversial issues and primarily on the mid-range alternatives. A number of sensitivity analyses considered early in the formulation of planning criteria were not conducted as the evolution of planning issues and alternatives diminished their relevance.

Some sensitivity analysis conclusions were reached by complex calculations using the detailed analytical tools available for analysis of effects of the full alternatives. Many other conclusions, however, were extrapolated and interpolated from analysis of impacts of the full alternatives. This approach, rather than direct calculation, was always taken where calculation of the impacts of the full alternatives was based on a ten-year timber management scenario developed for each alternative. The effort involved in developing and analyzing such a scenario for each sensitivity analysis was considered unwarranted, due to the time and cost involved.

The following sensitivity analyses were conducted:

- For Alternatives B, C, and D, the changes in socioeconomic effects and the effects on anadromous fish populations of differing levels of riparian zone protection, including legally required protection (the Alternative A standard).

- For the Preferred Alternative (PA), the effects of substituting the Alternative A and E levels and the level of protection suggested in October 1991 by the Scientific Panel on Late-Successional Forest Ecosystems in their watershed/fish emphasis option. The estimated changes in ASQ were based on calculations of changes in riparian acreages excluded from planned timber harvest. Employment effects are linked to ASQ only since no anadromous fish population changes are expected in the short term.

- Alternative A incorporated the change in socioeconomic effects, the effects on biological diversity and spotted owl habitat of the timber management areas (i.e., old-growth emphasis areas), and timber management prescriptions of the PA.

- Alternatives B, C, D, and the PA recognized the changes in socioeconomic effects, and the effects on biological diversity and spotted owl habitat of differing approaches to old-growth and mature forest protection. These options include:

    - Managing the lands allocated to timber production in Alternative B with no provision for protection of old-growth and mature forests.

    - Managing the lands allocated for timber production in Alternative B on a 250-year rotation.

    - Managing the lands allocated for timber production in Alternative B on a 150-year rotation.

    - Managing all lands allocated for timber production in Alternatives B and C entirely under either of Alternatives C's partial retention approaches.

    - Substituting the USF&WS proposed spotted owl recovery plan for the older forest or spotted owl protection approach in Alternatives B and D.

    - Substituting the 50-11-40 rule for management prescriptions on special management in the general forest management areas and connectivity areas in the PA.

- Allocating the restoration and retention blocks of Alternative C to 40 percent partial retention management.
- Accelerating density management in the restoration and retention blocks of Alternative C in the first decade to the extent practical.
- A minimum harvest age constraint of 60 years in Alternative D, vis-a-vis 40 years in D in many plans).
- Precluding all timber harvest in old-growth emphasis areas of the PA.
- No regeneration harvest of stands younger than cumulation of mean annual increment in the PA.
- No constraint on minimum age of stands subject to regeneration harvest in timber management emphasis areas of the PA (letting the harvest model select the age that maximizes sustainable ASQ in the decade of the plan).
- Foregoing planting genetically selected stock, vegetation management for release and precommercial thinning, fertilization, and stand conversion in the PA. To be analyzed for each practice individually and for all combined.
- Managing lands under the prescriptions of the PA but under the land allocations of Alternative A.

The conclusions of all these analyses are displayed in Table IV-A-1, at the back.

In addition, some sensitivity analyses of previously prevalent timber management prescriptions were done for Alternative A, as part of the analysis of the management situation. The analytical conclusions are displayed in Table IV-A-2.

Also for the analysis of the management situation, economic efficiency analyses were done for the following intensive management practices: precommercial thinning, commercial thinning, fertilization, and brush and hardwood conversion. These efficiency analyses were based on forestry practices of the 1980s and are less applicable to Alternative C and the PA, particularly since a primary emphasis of many practices in those alternatives is attainment of biological diversity objectives which are not readily valued in economic terms. The measure of economic efficiency is change in net present value (NPV). NPV is the sum of values of revenues less costs during the life of the stand, all values being discounted to the time of harvest of the previous stand. If the change in NPV from adding an intensive management practice is positive, it is considered economically efficient; that is, it adds more value than it costs.

All analysis, including discount rates, was based on values net of inflation. This is called using real prices instead of nominal prices. The basis of expected timber stumpage prices is the average BLM timber sale price for the 1984-1988 period. For the primary analyses, future real wood price increases were estimated at 1.2 percent annually, based on the U.S. Forest Service's 1989 Resources Planning Act assessment. A discount rate of four percent was used because it was considered to best represent the long-term outlook. Analyses of precommercial thinning, commercial thinning, and fertilization for each site index were made of both understocked and well-stocked stands, assuming final harvest ages of 50, 60, 70 and 80 years. In general, fertilization or a combination of fertilization and commercial thinning results in a positive NPV for stands harvested at age 60.

For comparison and sensitivity testing, identical analyses were made using the following alternative assumptions: (1) zero real wood price increase and four percent discount rate, (2) 1.2 percent real wood price increase and seven percent discount rate, and (3) zero real wood price increase and seven percent discount rate. Under the first assumption, commercial thinning results in a positive NPV in all tests and fertilization results in a positive NPV in about one-half of the analyses. Precommercial thinning analyses indicate a

Table IV-4-2. Annual Allowable Sale Quantity (ASQ) and Long-Term Sustained Yield (LTSY) of Sensitivity Analyses for Alternative A.

Analysis	MMCF	MMBF by Decade					
		1	2	3	5	10	20
1. Highest ASQ	46.22	293.9	288.2	267.1	263.1	261.2	274.3
2. CMAI	34.46	220.2	218.3	211.6	201.6	209.0	205.4
3. Min Diameters							
A. 12 inches	45.00	287.7	280.7	261.7	257.2	256.6	268.4
B. 16 inches	29.84	190.4	190.2	186.5	176.9	182.9	177.6
C. 20 inches	16.04	178.2	174.4	176.3	178.3	162.7	166.3
D. 24 inches	10.36	65.3	66.4	66.8	66.4	65.9	60.9
4. Base Program	38.81	249.0	243.6	229.2	222.4	216.2	232.3

negative NPV in most analyses. Under the second assumption, commercial thinning again results in a positive NPV for all analysis and fertilization and precommercial thinning indicate a negative NPV for all analyses. Under the third assumption, the results were similar to those for the second assumption.

Analysis of hardwood or brush site conversion to conifers focused on estimating the maximum amount which could be spent on the practice while achieving a positive NPV. Generalized conclusions about economic efficiency of this practice were not reached, as the cost of conversion varies widely from site to site. Among the relevant factors in site-specific analysis would be the stumpage value of any trees on a site. At 1.2 percent real wood price increase, with a four percent discount rate, up to $1,406 per acre could be spent if harvest at age 60 was expected. The maximum amount economically feasible for any site declines as harvest age lengthens. Under other economic assumptions tested, it is also lower.

Complete documentation of the Economic Efficiency Analysis is available in the District Analysis of the Management Situation.

Table IV-A-1. Sensitivity Analysis of Land-Use Allocations.

				Estimated Changes (Comparison to Base Alternative)						
									Biological Diversity (100 Years)	
Allocation or Decision Element	Base Alternative	Base ASQ MMCF	Changed Allocation	ASQ CHANGE (MMCF)	Local Employment (Jobs)	County Revenue ($1,000) (10 Years)	Anadromous Fish Populations (200 Years)	Spotted Owl Habitat (100 Years)	Structural Diversity	Old Growth (ac.)
Riparian Zone Protection [2]	B	41.87	Alt. A	+ 0.42	25	1,948	1			
			Alt. C	- 0.50	- 30	- 2,320	No Change			
	C	14.02	Alt. A	+ 0.43	26	2,285	1			
			Alt. B	+ 0.24	15	1,275	No Change			
			Alt. D	- 1.17	- 71	- 6,216	No Change			
	D	13.50	Alt. A	+ 2.57	157	13,566	1			
			Alt. C	+ 1.24	76	6,546	No Change			
			Alt. E	- 1.34	- 82	- 7,074	No Change			
	PA	20.10	Alt. A	+ 4.60	281	23,887	1			
			Alt. E	- 13.20	- 805	- 68,545	No Change			

Table IV-A-1. Sensitivity Analysis of Land-Use Allocations (continued).

Allocation or Decision Element	Base Alternative	Base ASQ MMCF	Changed Allocation	Estimated Changes (Comparison to Base Alternative)						
				ASQ CHANGE (MMCF)	Local Employment (Jobs)	County Revenue ($1,000) (10 Years)	Anadromous Fish Populations (200 Years)	Spotted Owl Habitat (100 Years)	Biological Diversity (100 Years) Structural Diversity	Biological Diversity (100 Years) Old Growth (ac.)
Old-Growth and Mature Forest	A	46.20	PA Timber Management Areas and Prescriptions	- 17.72	- 1,045	- 80,317				
	B	41.87	250-Year Rotation on Protected Lands	+ 0.70	42	3,247		-	-	
			150-Year Rotation on Managed Lands	- 28.47	- 708	- 132,076		+[3]	+	
			17.5% Partial Retention on Managed Lands	- 25.32	- 519	- 117,463		+	+	
			40% Partial Retention on Managed Lands	- 29.26	- 1,756	- 135,741		+	+	
			Proposed Spotted Owl Recovery Plan	- 34.20	- 2,052	- 158,659		+	+	+
	C	14.02	All 17.5% Partial Ret.	+ 1.83	112	9,723		-	-	-
			All 40% Partial Ret.	- 2.34	- 143	- 12,433		+	+	+
			All 17.5% Partial Ret. but no Harvest of Oldest	+ 1.83	112	9,723		+	+	+
			40% Partial Retention in R&R Blocks	+ 1.88	115	9,988		-	-	-
			Accelerate Density Mgmt. in R&R Blocks	+ 0.78	48	4,144		+	+	+

Table IV-A-1. Sensitivity Analysis of Land-Use Allocations (continued).

Allocation or Decision Element	Base Alternative	Base ASQ MMCF	Changed Allocation	ASQ CHANGE (MMCF)	Local Employment (Jobs)	County Revenue ($1,000) (10 Years)	Anadromous Fish Populations (200 Years)	Spotted Owl Habitat (100 Years)	BiologicalDiversity (100 Years) Structural Diversity	BiologicalDiversity (100 Years) Old Growth (ac.)
				Estimated Changes (Comparison to Base Alternative)						
	D	13.50	Proposed Spotted Owl Recovery Plan	- 8.53	- 520	- 45,028		+	+	+
			60 Yr. Min. Harvest Age	- 2.57	- 157	- 13,566		+	+	+
	PA	20.10	50-11-40 Rule in the Connectivity Areas	- 0.25	- 15	- 1,298		+	+	+
			No Harvest Old-Growth Emphasis Areas	- 2.04	- 124	- 10,593		+	+	+
			No Harvest Below CMAI	- 4.13	- 252	- 21,446		+	+	+
			Unconstrained Min. Harvest Age, General Forest Mgmt. Areas	+ 2.08	127	10,801		-	-	-
			Scientific Panel[4] Watershed Protection	- 2.45	- 150	- 12,722				
			Proposed Spotted Owl Recovery Plan	- 12.32	- 752	- 63,975				
			No Genetic Stock	- 0.64	- 39	- 3,323				
			No Release and PC Thinning	+ 0.32	20	1,661				
			No Fertilization	- 2.32	- 142	- 12,047				
			No Stand Conversion	- 0.24	- 15	- 1,246				
			No Intensive Management Practices (4 preceding)	- 2.74	- 167	- 14,228				

Table IV-A-1. Sensitivity Analysis of Land-Use Allocations (continued).

[1] Substituting Alternatives A's level of riparian protection for that of Alternatives B, C, or D could result in maintenance of current habitat for anadromous fish populations (to the extent that BLM actions influence that) rather than the long-term increases predicted under Alternatives B, C, and D.

[2] Increased riparian zone protection also contributs to biological diversity, and the reverse is true.

[3] Would provide better roosting and foraging habitat than baseline alternative, but no more nesting habitat.

[4] Scientific Panel on Late-Successional Forest Ecosystems.

Abbreviations used in this Table:+ = Improving
- = Decreasing

Appendix IV-B

Analytical Assumptions about Global Climate Change

Many scientists have predicted significant global warming within the next 60 years due to increasing levels of carbon dioxide and other gases in the atmosphere. Others have further hypothesized a climate change in western Oregon that would make it difficult or impossible to maintain, without change, the current ecosystems, including the major forest tree species. Among the relevant uncertainties, it is expected that warmer, drier weather would increase the incidence of wildfire, but warmer, wetter weather might reduce it. Rapid change may make the forest more susceptible to insect and disease attack because generational succession occurs much more quickly among pests than among trees. Other possible effects include raising soil temperatures and lengthening summer droughts. This could shift the range of Douglas-fir forest toward higher elevations, reduce the range for current high-elevation species, and increase the range for dryland species such as lodgepole and ponderosa pine. Thus, management practices, particularly stand establishment and manipulation, could be affected. Assuring adequate tree regeneration would probably be the most serious management problem in areas that become marginal (Regens et al. 1989).

There is, however, no scientific consensus about the expected extent or rate of global warming nor the probable effect on forest ecosystems in western Oregon. Neither the environmental record nor the limited capabilities of the climate models permit a reliable forecast of climate changes (NAS 1991).

Furthermore, available models show marked differences in their predictions of change in western Oregon (Joyce et al. 1990). In addition, the most commonly predicted temperature changes are not expected to affect woody biomass production or the dominance of Douglas-fir in the region, although they could alter codominant species composition in older forests (Dale and Franklin 1989). At the high end of the range of predicted changes, however, are temperature increases that could be great enough, by around the middle of the 21st century, to inadequately meet the winter chilling requirement for Douglas-fir to start growth again in the spring (Lavender 1989).

The increasing carbon dioxide levels are generally thought to be beneficial to plant growth, but available information does not suggest which forest tree species may be most responsive to that increase or how their responsiveness may also be affected by any changes in climate or by fertilization in managed forests.

Although climate change may occur and may, in a number of decades, affect the species composition of the forest, it is not considered likely to affect forestry practices during the expected ten-year life of the plan. None-the-less, the draft plan incorporates a process of adaptive management (see Chapter 2, Management Direction Common to All Alternatives, Use of the Plan) permitting effective response to changing knowledge. Thus, should a scientific consensus emerge during the life of the plan, indicating that forestry practices should be modified promptly in anticipation of the effects of global warming, the BLM will be able to adjust.

Appendix IV-C

Ten-Year Mineral Development Scenarios

Introduction

This appendix describes the Reasonably Foreseeable Development (RFD) scenarios for development of leasable, locatable, and salable mineral commodities. The purpose of the RFD scenario is to provide models that anticipate the level and type of future mineral activity in the planning area, and to serve as a basis for cumulative impacts analysis. The RFD first describes the steps involved in developing a mineral deposit, with presentation of hypothetical exploration and mining operations. The current activity levels are discussed in Chapter 3 of this document. Discussions about future trends and assumptions affecting mineral activity are followed by the prediction and identification of anticipated mineral exploration and development.

Scope

The development scenario is limited in scope to BLM-administered lands in the planning area. The RFD is based on the known or inferred mineral resource capabilities of the lands involved, and applies the conditions and assumptions discussed under Future Trends and Assumptions. Changes in geologic data and/or economic conditions that alter the RFD would result in some deviation over time.

Leasable Minerals

Reasonably Foreseeable Development of Oil and Gas Resources

(Common to All Alternatives)

Future Trends and Assumptions

Based on the history of past drilling and foreseeable development potential in the planning area, activity over the next decade would continue to be sporadic. Even though the central portion of the Coos Bay District has been evaluated as having a high potential for the development of hydrocarbons, it is not anticipated that there would be a discovery of producible oil and gas fields within the district during the plan period. Oil and gas activity is expected to consist of the issuance of competitive and over-the-counter leases, geophysical surveys, and perhaps the drilling of three exploratory wells.

Some exploration for natural gas is predicted. The supply of natural gas in the region has been plentiful and is forecast to remain that way in the future. The price of natural gas recently dropped and predictions are that future prices may stay at, or close to, the current price. Recent economic conditions within the oil industry also resulted in a decline in the number of active exploratory wells being drilled in other parts of the nation. Continued low prices and depressed economic conditions would result in a nationwide decrease in domestic exploration and development. A turnaround in the oil industry, or an increase in the price of oil and gas purchased from other countries, would spur an increase in demand for domestic production, increasing the number of wells drilled.

Geophysical Explorations

Geophysical exploration is conducted to try to determine the subsurface structure of an area. Three geophysical survey techniques are generally used to define subsurface characteristics through measurements of the gravitational field, magnetic field, and seismic reflections.

Gravity and magnetic field surveys involve small portable measuring units which are easily transported via lightweight off-road vehicles (such as four-wheel drive vehicles) or aircraft. Both off-road and on-road travel may be necessary in these two types of surveys. Usually a three-man crew transported by one or two vehicles is required. These two survey methods can make measurements along defined lines, but it is more common to have a grid of discrete measurement stations.

Seismic reflection surveys, which are the most common of the geophysical methods, produce the most detailed subsurface information. Seismic surveys are accomplished by sending shock waves, generated by a small explosion or mechanically beating of the ground surface, through the earth's surface, reflecting off some layers, thus depicting the underlying structure of the rock. The thumper and vibrator methods pound or vibrate the ground surface to create a shock wave. Usually four large trucks are used, each equipped with pads about four-feet square. The pads are lowered to the ground, and the vibrators are electronically triggered from the recording truck. Once information is recorded, the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each recording site.

The small explosive method requires that charges be detonated on the surface or in a drill hole. Holes for the charges are drilled utilizing truck-mounted portable drills to drill small-diameter (two to six-inch) holes to depths of 100 to 200 feet. Generally 4 to 12 holes are drilled per mile of line and a 5 to 50-pound charge of explosives is placed in the hole, covered, and detonated. The created shock wave is recorded by geophones placed in a linear fashion on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. A typical drilling seismic operation may utilize 10 to 15 men operating five to seven trucks. Under normal conditions, three to five miles of line can be surveyed daily using this method. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track-mounted air rigs, water trucks, a computer recording truck, and several light pickups to transport people conducting the survey.

Public and private roads and trails are used where possible. However, off-road cross-country travel is also necessary in some cases. Graders and dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, usually resulting in a well-defined two-track trail. Drilling water, when needed, is usually obtained from private landowners.

A Notice of Intent authorizes geophysical exploration when there is no mineral lease on the tract. It is anticipated that one Notice of Intent, involving seismic reflection surveys would be filed during the life of this plan.
The surface charge method utilizes charges of between one and five pounds attached to wooden laths three to eight feet above the ground. Placing the charges lower than six feet usually results in the destruction of vegetation, while placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance.

Surface Impacts of Geophysical Explorations

It is anticipated that the foreseeable geophysical explorations for oil and gas in the planning area will consist of seismic reflection surveys, utilizing approximately 10 miles of existing roads. Surface impacts would involve temporary blockage of the roads by the four large trucks used to gather the data with a vibrating platform, but no damage to the roads is expected using this type of equipment. The small explosive method is also anticipated to be used on approximately 20 miles of line. Surface disturbance is expected to consist of drilling four to twelve holes per mile of line. Each drill hole would impact about 200 square feet, but 90 percent of these holes are expected to be drilled on existing landings, spur roads, or timber haul roads. Therefore, 7,200 square feet (approximately 0.2 acre) of existing road surface would temporarily be impacted by drilling activities and low power blasting. Blasting would not be powerful enough to impact any surface resources or improvements. It is anticipated that four drill holes would be made on areas currently undeveloped. The drill pads would impact approximately 200 square feet each with short spur roads (100 feet long and 25 feet wide) constructed to each drill hole location. Surface disturbance of these four drill holes would affect approximately 0.25 acre. The total surface disturbance using the drilling, blasting method is expected to total approximately 0.5 acre.

Drilling Phase

One Notice of Staking is anticipated during the plan period. It is anticipated that the company would then also submit an Application to Drill (APD) after the Notice of Staking is accepted. Private surface owner input would be actively solicited during this stage. Once the APD is approved, the operator may begin construction activities in accordance with stipulations and conditions. When a site is chosen that necessitates the construction of an access road, the length of road may vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes may dictate a longer route in some cases. Drilling activity in the planning area is predicted to be done using existing roads and constructing short (approximately 0.25 mile) roads to access each drill site location.

Based on past oil and gas drilling in Oregon, it is projected that three exploratory “wildcat” wells would be drilled on BLM-administered land in the planning area. The estimated success rate of finding hydrocarbons is predicted to be no greater than 10 percent, based on the average U.S. wildcat well success rate. Drilling is expected to occur in an area of “moderate” oil and gas potential which is the highest level of potential for oil and gas on this district. There is approximately a one in 50 chance of new field discovery during the life of the plan, with a strong likelihood that any such discovery would be natural gas, since current western Oregon production to date has been natural gas.

Surface Impacts of Drilling

During the first phase of drilling, the operator would move construction equipment over existing maintained roads to the point where the new access road begins. No more than 0.25-mile of moderate duty access road with a surface 18 to 20 feet wide is anticipated to be constructed. The surface disturbance width would average 40 feet including ditches, cuts, and fills; acreage impacted by road building would total approximately three acres.

The second part of the drilling phase is the construction of the drilling pad or platform, anticipated to involve approximately two acres per well site. Support facilities are anticipated to disturb about two acres per well site. The likely duration of well development, testing, and abandonment is predicted to be approximately six months for each drill site. Therefore, the total disturbance for the exploratory wells, support services, and new road construction is expected to be approximately 12 acres. The surface disturbance would be restricted, as much as possible, to previously disturbed areas such as logging roads and landings.

Producing Phase

One gas field of 50-60 billion cubic feet (BFC) could be discovered on BLM-administered lands at a depth of 2,000 to 3,000 feet during the plan period. It is estimated that the productive life span of this field would be about 10 years. The size of the field would be approximately 200 acres and the well spacing would be about 160 acres (one well per quarter section). It is anticipated that the field would require four development wells in addition to the discovery well. All gas production would be carried by pipelines for a distance of approximately 40 miles. All well service requirements would be provided by established service companies.

Surface Impacts of Field Development and Production

Each development well pad would be approximately two acres in size and, as a result, a total of eight acres would be involved in drill pad construction. New roads leading to each of these drill pads would have to be constructed and it is estimated that each of the new roads would be about 0.25 mile in length with a right-of-way width of 40 feet. Therefore, approximately 1.25 acres would be involved for each newly constructed road, and the total surface disturbance attributed to new road construction would be five acres. A pipeline 40 miles in length with a right-of-way width of 30 feet would disturb about 145 acres. Due to the checkerboard public land ownership in this area, it is estimated that only about 50 percent of that acreage would be on public lands administered by the BLM. Therefore, it is estimated that about 73 acres of BLM-administered land would be impacted from pipeline construction. The total surface disturbance of field development and production would be approximately 86 acres.

Plugging and Abandonment

Wells that are completed as dry holes are plugged according to a plan designed specifically for the down-hole conditions of each well. Plugging is accomplished by placing cement plugs at strategic locations from the bottom of the well to the surface. Drilling mud is used as a spacer between plugs to prevent communication between fluid-bearing zones. The casing is cut off at least three feet below ground level and capped by welding a steel plate on the casing stub. It is predicted that the three exploratory wells drilled would be plugged and abandoned.

Surface Impacts of Plugging and Abandonment

After plugging, all equipment and debris would be removed and the drill site would be restored as near as reasonably possible to its original condition. If the 0.25-mile of new road constructed for drilling is not needed for future access to the area, the road would be reclaimed using a winged subsoiler, waterbars installed if necessary, and the road prism revegetated as required by the Authorized Officer.

Reasonably Foreseeable Development of Coal Resources
(Common to All Alternatives)

Future Trends and Assumptions

Based on the history of past mining activity and foreseeable development potential in the plan area, mining activity over the next 10 years will continue to be minimal at best. No significant increase in coal development is anticipated because the quality and mineability of the coal in the Coos Bay District varies greatly. One or two exploration holes are anticipated. The national supply of coal has been plentiful and is forecast to remain that way. Therefore, little demand is expected for local coal reserves.

Exploration

As with oil and gas, coal exploration operations could take place on leased or unleased public land. Depending upon the status of the land (leased/unleased), the status of the applicant (lessee/nonlessee), and the type of operation proposed, (drilling, trenching, or surface mapping), several types of authorizations could be used if the proposed exploration exceeds "casual use," as defined in 43 CFR 3480.1. In all cases, the authorizations require compliance with the National Environmental Policy Act and approval by the Authorized Officer. As with oil and gas, the operator would be required to comply with all terms and conditions of the permits, regulations, and other requirements, including reclamation, prescribed by the Authorized Officer. Monitoring for compliance with these requirements would be done during the execution of the operations and upon completion.

Surface Impacts of Prospecting

Types of surface-disturbing activity associated with coal exploration include field mapping, establishing a grid system to determine a logical mining unit, and frequently using off-road vehicles with a small auger drilling unit to determine the feasibility of the field.

Mining Phase

Mine Development

If exploration results show that an economically mineable deposit is present, a lease is acquired and activity intensifies to obtain detailed knowledge regarding reserves and possible mining methods. This process involves applying all the previously utilized exploration tools in a more intense effort. Once enough information is acquired, a feasibility study is made to decide whether to proceed with mine development and which mining methods would be utilized. Because of the geology of that portion of the Coos Bay District where coal is located, however, the only feasible way to mine coal would be through underground methods.

Once the decision to develop the property is made, the mine permitting process commences. Upon approval, work begins on development of the mine infrastructure. This includes constructing the offices and laboratory, prestripping in preparation for mining, building of access haul roads, and placing of utility services. During this time additional refinement of ore reserves is made.

Once the facilities are in place, actual mine production begins. Concurrent with production there often are "satellite" exploration efforts to expand the mine's reserve base and extend the project life. Reclamation of the property is conducted concurrently with, or upon completion of, the mining operation.

Activities that could occur on these lands include: actual mining; coal processing; tailings disposal; waste rock placement; and placement of support facilities such as repair shops, labs, and offices. Such activities involve the use of heavy earthmoving equipment and explosives for mining and materials handling, hazardous or dangerous reagents for processing requirements, and general construction activities. The size of mines varies greatly and not all mines would require all the previously mentioned facilities and equipment. Acreage involved can range from a few acres to several hundred acres, with some underground operations disturbing 100 acres or more.

Surface Impacts of a Coal Mine Development

Less than 50 acres is expected to be involved in the mining of coal in the planning area over the next decade.

Reasonably Foreseeable Development of Geothermal Resources

(Common to All Alternatives)

Future Trends and Assumptions

With environmental protection and enhancement being a major consideration in the Pacific Northwest, clean, low-impacting energy sources are becoming more important. The energy surplus in the region is expected to be depleted near the end of the decade. The abundant geothermal resources thought to be present in the northwest, however, are essentially undeveloped. To encourage resource development, the Bonneville Power Administration is offering to participate in three geothermal pilot projects. The three projects are east of the Cascade Range, in totally different geologic environments. There is little probability that there would be any geothermal development in the Coos Bay District during the life of the plan.

Locatable Minerals

Reasonably Foreseeable Development of Locatable Mineral Resources

(Common to All Alternatives)

Future Trends and Assumptions

The major commodities of interest would continue to be the precious metals, gold and silver; with nickel and cobalt ores also becoming economically important in the Coos Bay District. This premise is based on a combination of price and the favorable geology for mineral occurrences. Reclamation science would continue to advance due to experience and research. This factor is most important with regards to the nickel laterite deposits. A more detailed design effort will be placed on the reclamation of mined lands in the future. This emphasis would lead to an overall increase in reclamation costs, but those costs should pay dividends in the long term with increased reclamation success.

The economics of mining in the planning area would largely depend upon the relationship between production costs and the market price of the commodity. While production costs can be controlled, or anticipated through management and technology, the big unknown will be the price of the mineral commodities. The overall profitability of an operation (mainly involves the level of activity at the prospecting, exploration, and mining phases) for development of ore bodies will be closely related to the price of the mineral commodity.

No chemical heap leaching operations are forecast during the plan period; however, any such operation proposed would be subjected to environmental review under a Plan of Operations pursuant to regulations found in 43 CFR 3809. All locatable mineral operations will be monitored pursuant to these regulations and the policies shown in Appendix II-K.

Development of Locatable Mineral Resources

Exploration Phase

Reconnaissance

Reconnaissance level activity is the first stage in exploring for a mineral deposit. This process involves the initial literature search of an area of interest, using available references such as publications, reports, maps, and aerial photos. The area of study can vary from hundreds to thousands of square miles. Activity that would normally take place includes large scale mapping, regional geochemical and geophysical studies, and remote sensing with aerial photography or satellite imagery. The type of surface-disturbing activity associated with reconnaissance level mineral inventory usually consists of occasional sampling to determine stream sediment, soil, or rock composition. Minor off-road vehicle use may be required.

Prospecting

The prospecting area of interest is identified through reconnaissance of areas having anomalous geochemical or geophysical readings, unique geologic structures or features, the occurrence of typical mineral-bearing formations, or a historical reference to past mineral occurrence. This area may range from a square mile to an entire mountain range of several hundred square miles.

Activity that will take place in an effort to locate a mineral prospect includes more detailed mapping, sampling, and geochemical and geophysical study programs. This is the time when property acquisition efforts usually begin and most mining claims are located to secure ground while trying to make a mineral discovery.

Surface Impacts of Prospecting

Types of surface-disturbing activity associated with prospecting generally involve soil and rock chip sampling using mostly hand tools, possibly off-road vehicle use, and placement and maintenance of mining claim monuments. This activity is normally considered "casual use" (43 CFR 3809.1-2) and does not require BLM notification or approval. Surface disturbances by these activities are anticipated to be less than 0.01-acre for each prospecting venture.

Exploration

Upon location of a sufficiently anomalous mineral occurrence, or favorable occurrence indicator, a mineral prospect is established and is subjected to more intense evaluation through exploration techniques. Activities that take place during exploration include those utilized during prospecting but at a more intense level in a smaller area. Activities such as road building, trenching, and drilling are also conducted. In later stages of exploration, an exploratory adit or shaft may be driven. In addition, if the prospect already has underground workings these may be sampled, drilled, or extended. Exploration activities utilize mechanized earth moving equipment and drill rigs, and may involve the use of explosives.

Exploration for uncommon variety silica sand could occur on lands with sand dunes on the North Spit west of Coos Bay/North Bend, Oregon.

Surface Impacts of Placer Exploration

Placer exploration consists of test pit digging either by hand or with a backhoe or hydraulic excavator. It is predicted that six Notices would be received during the plan period. A typical Notice would describe minor road construction necessary for accessing three test pit locations. The size of each test pit is predicted to be about five feet square, and 10 to 15 feet deep. It is anticipated that three temporary access roads approximately 200 feet long and 25 feet wide would be necessary to reach the test pit locations with the equipment, affecting roughly a total of 0.3 acre of new roads. Support facilities would utilize approximately one acre. Therefore, each Notice-level operation would utilize approximately 1.3 acres of land, and during the plan period the expected six operations would disturb approximately eight acres of land.

If low mineral values are discovered, the pits would be backfilled and the area seeded and fertilized as described in the policies shown in Appendix II-K-1. If significant mineral values are discovered, then the Notice level operation is predicted to develop into a Plan level of operation as described under the Bench Placer RFD.

Surface Impacts of Uncommon Variety Silica Sand Exploration

Exploration for silica sand of an uncommon purity would involve no road construction on dunal areas to reach the deposit. Sampling would be conducted along the side of the roads, so no additional site disturbance would be necessary in the construction of a drill pad.

Surface Impacts of Laterite Placer Exploration

It is anticipated that one Plan of Operation would be filed during the plan period pursuant to 43 CFR 3809.1-4. It is predicted to be for a nickel laterite exploration project, and approximately 10 holes would be drilled utilizing truck mounted drill rigs. Each drill site would disturb less than 0.1 acre. Temporary access roads would be constructed for three of the drill holes, but in most cases the existing roads would be utilized. Each of these temporary access roads would be approximately 300 feet long and 40 feet wide, including roadcuts, ditches, and fill slopes involving approximately 0.25-acre for each road (0.75 acre total). Support facilities may be necessary, affecting approximately one acre. Therefore, during the first phase of exploration, it is anticipated that 2.75 acres would be disturbed.

In the second phase of exploration, it is predicted that the operator would conduct drilling and sampling on a defined grid to better evaluate the amount of ore reserves within the project area. Additional equipment access roads would be necessary to complete this exploratory drilling and it is estimated that 10 temporary access roads (of the length and width mentioned above) would be necessary to conduct this drilling, affecting about 2.5 acres. The ten new drill holes collectively would disturb about one acre. Therefore, the second phase of exploration would disturb an additional 3.5 acres. The total anticipated acreage involved in the plan-level lode exploration project would be approximately 6.25 acres.

Mining Phase

Mine Development

If exploration results show that an economically viable mineral deposit is present, activity intensifies to obtain detailed knowledge regarding reserves, possible mining methods, and mineral processing requirements. This process involves applying all the previously utilized exploration tools in a more intense effort. Once enough information is acquired, a feasibility study is made to decide whether to proceed with mine development and which mining and ore processing methods will be utilized.

When the decision to develop the property is made, the mine permitting process begins. Upon approval, work begins on development of the mine infrastructure. This includes constructing the mill, offices and laboratory, prestripping in preparation for open pit mining, building of access and haul roads, and placing of utility services. During this time additional refinement of ore reserves is made.

When facilities are in place, actual mine production begins. Concurrent with production there often are “satellite” exploration efforts to expand the mine’s reserve base and extend the project life. Reclamation of the property is conducted concurrently with, or upon completion of, the mining operation. Often subeconomic resources remain unmined and the property is dormant, waiting for changes in commodity price or production technology that would make these resources economic.

Activities that could occur on these lands include: actual mining, ore processing, tailings disposal, waste rock placement, solution processing, metal refining, and placement of support facilities such as repair shops, labs, and offices. Such activities involve the use of heavy earthmoving equipment and explosives for mining and materials handling, exploration equipment for refinement of the ore reserve base, hazardous or dangerous reagents for processing requirements, and general construction activities. These activities will probably involve 40 to 60 full-time employees.

The size of mines varies greatly and not all mines would require all the previously mentioned facilities and equipment. Acreage involved can range from a few acres to several hundred acres, with most projects disturbing 100 acres or less, requiring both a Plan of Operations and monitoring per regulations in 43 CFR 3809.1-4.

Bench Placer Mine

Bench placer operations can vary in size from one to six persons operating excavators, backhoes, loaders, larger dozers, trommels, vibratory wash plants, draglines, and sluice boxes. Other associated equipment includes water pumps, generators, and conveyors. These operations vary in scope, processing between 10 to 500 loose cubic yards of gravel per day. The average operation of this type processes 50 cubic yards per day, operating 90 days per year.

The mining process could be generalized as follows: vegetation and overburden removal, excavation of bench gravels, hauling of mineral-bearing gravels to processing plant, washing of gravel with water, concentrating heavy metals in sluice box, and replacement of tailings into the excavated area as part of the reclamation plan.

Surface Impacts of Bench Placer Development

It is anticipated that the excavation area for mineral extraction would disturb approximately five acres. The finer material that washes over the sluice box is allowed to settle in settling ponds to prevent siltation of adjacent streams. The water in the pond could be recycled through the wash plant to conserve water; and after the tailings are contoured for reclamation, the soil could be spread over the gravels and reseeded. Other associated activities include the need for support facilities (0.75 acre); road construction for access and ore hauling (approximately 0.75 acre); construction of settling ponds approximately 200 feet by 60 feet by 15 feet deep (0.5 acre total); and water diversion for a wash plant. In extreme cases the streams might be diverted into alternate channels so that the stream channel could be mined following issuance of the necessary state permits. Approximately 0.5 acre would be needed for stockpiling overburden and topsoil to be used during site reclamation. Therefore, it is anticipated that the total disturbed area would involve approximately 7.5 acres for a bench placer mining operation.

Silica Sand Mine

Silica sand operations could vary in size from three to twenty persons operating excavators, backhoes, dozers, draglines, magnetic separators, and trucks (or trains) for taking the silica to the processing site. Other associated equipment could also include conveyors and support facilities. These operations could process up to 1,000 cubic yards of sand per day, operating year round.

The mining process could be generalized as follows: vegetation and overburden removal, excavation of dunal sands, transportation of the sand to the magnetic separator, placement of heavy minerals at a waste stockpile site nearby, and transportation of refined silica to the processing plant.

Surface Impacts of Silica Sand Mine Development

The mine excavation area is anticipated to involve the disturbance of about 20 acres. It is anticipated that approximately two acres would be needed to stockpile overburden and heavy minerals extracted from the deposit. Approximately 0.5 acre would be utilized for disposal of vegetation removed from within the mine development area. Approximately one acre would be utilized for the office site and magnetic separation facility. Therefore, approximately 23.5 acres would be impacted by the silica mine development.

Due to the proximity of the groundwater table to the surface, it is assumed that site reclamation could generate a lake or large pond which would be revegetated to benefit wildlife in the area.

Lode Mine

If an economic lode deposit for gold were discovered in the planning area, the following scenario would probably develop.

Mining operations at a hydrothermal gold deposit in the planning area would involve stripping of large amounts of overburden comprised not only of soil, but waste rock. Due to steep terrain, it is expected that the stockpile site for this material would be at a distance where the overburden will have to be hauled by truck and unloaded rather than pushed aside by bulldozer. Drilling, blasting and crushing the gold ore would be conducted at the site.

Surface Impacts of Lode Mine Development

The mine excavation area is anticipated to involve the disturbance of about 10 acres. It is anticipated that approximately two acres would be needed to stockpile overburden and topsoil near the mined area. Approximately two acres would be needed for support facilities and a staging area, and new haul roads would involve disturbing about two acres. Therefore, approximately 16 acres would be impacted by this lode mine development. Mineral processing is anticipated to be conducted elsewhere due to the steep topography.

Surface Impacts of Lode Exploration

It is anticipated that one Notice would be filed during the plan period pertaining to vein lode exploration and possible development. Exploratory work including drilling, blasting, and bulk sampling would be the emphasis of these projected notice-level operations. Some road and trail construction is anticipated for the operator to access the exploration sites for sample collection.

For that Notice, it is anticipated that three temporary access roads, 200 feet long by 40 feet wide (including cuts, fills, and ditches), would be necessary for equipment to reach the exploration sites. Surface disturbance for roads therefore, would be approximately 0.5 acre. Support facilities would most likely be needed and would involve the use of about one acre. The mineral sample sites (including three drill sites and two bulk sample sites) would probably disturb about 0.5 acre. No Plans of Operation are anticipated during the life of the Plan and therefore no lode mine development is expected.

Recreational Mining

Most recreational mining operations on BLM-administered lands in the planning area are anticipated to utilize hand tools or portable suction dredges. Most of the recreational mining operations are expected to be conducted in the recreation area in the Sixes River drainage. Some recreational mining may also occur at the Sixes River Recreational Panning Site or at other locations throughout the district where casual use level mineral specimen collecting has occurred. In situations where either camping (in excess of 14 consecutive days) or the use of motorized equipment is proposed, a Notice would be required of the operator.

In-stream dredging is usually one or two people using a floating suction dredge with a five-to-seven horsepower engine. The dredge pulls up all the gravel in the stream down to bedrock. The gravels are passed over a sluice box and are returned to the stream without the gold. This process does not require any chemicals. Most of the dredges have an intake nozzle opening of less than five inches diameter. In some areas (such as the Sixes River Recreation Area) the intake nozzle is limited to four-inch maximum. The average stream area disturbed in any year is approximately 0.25 acre per dredge operation or about 10,000 square feet, based on operations monitored in the past. Other activities associated with dredging include temporary occupancy, and minor road and trail construction. It is predicted that 10 Notices would be filed for this type of mining activity. These operations would be monitored pursuant to the regulations found in 43 CFR 3809.1-3.

Surface Impacts of Suction Dredging Operations

Approximately 0.15 acre is expected to be disturbed by each in-stream suction dredging operation, and for each operation a camping area approximately 0.10 acre in size would be utilized. Therefore, during the plan period, the 30 anticipated Notices expected to be filed pertaining to these operations would affect a total of 7.5 acres of land.

It is anticipated that hobby mineral collecting and rockhounding would take place on the BLM lands in the operating area, however the surface impacts of those operations are presumed to be negligible since the mineral collectors most often use existing roads and look for surface geologic exposures. Any excavation of specimens is generally conducted with hand tools and is considered casual use.

Salable Mineral Resources

Reasonably Foreseeable Development Scenarios

Future Trends and Assumptions

Projections are that the public would continue to request the use of mineral materials from quarry sites located on the district. When possible, the use of existing sources is preferred; however, new site development is not precluded in this plan.

Development of Salable Mineral Resources

The quality and quantity of the mineral materials available at a given site are important factors in the decision of whether or not a source is used by either the public or government agencies. The site location and distance to the point of use is another important consideration.

Surface Impacts of Rock Quarry Development

Alternatives NA, A, B, C, PA

Under any of these five alternatives, five new quarry sites are expected to be developed in the operating area during the plan period. Estimates are that each site would disturb approximately two acres of land. This acreage would be developed for use as a rock crushing operating area, truck turn-around, access trails for bulldozers and drills, overburden stockpile sites, and aggregate stockpile areas. For access to the new quarry site, approximately 0.5 acre of land would be disturbed by new road construction, and developed in conjunction with a timber sale contract. Therefore, it is anticipated that approximately 12.5 acres would be impacted by new quarry site development.

The 32 existing quarry sites on the district could be utilized. Six sites could be expanded during the plan period, but the expansions most likely would be less than two acres each.

It is expected that one of the existing quarry sites would be depleted in the operating area during the plan period. After all useable rock is removed, reclamation work would be conducted according to an approved interdisciplinary plan.

Alternatives C, D, and E

It is anticipated that no new quarry sites would be developed during the plan period and that mineral materials would be taken from within the existing quarry site developments around the district. Due to the decreased demand for mineral materials under these alternatives, it is not anticipated that any of the existing sites would be depleted of rock; therefore, no site reclamation work is expected to occur during the plan period.

Appendix IV-D

Soil Compaction, Erosion, Nutrient Status, and Biology

Soil disturbance is often an unavoidable consequence of many forest management activities, and the district's soils differ in their degree of sensitivity to disturbances. The type and extent of disturbance determines the effects on long-term soil productivity. The timber management practices (which include road construction) that create the most disturbances cause compaction and displacement, erosion, and loss of organic materials and nutrients.

Compaction and Displacement

Soil compaction, a process that makes soils more dense, is usually caused by physical pressure and vibration exerted on the soil surface. Compacted soils can have significantly reduced plant growth due to reduced water infiltration and permeability, poor aeration and gas exchange, and lower nutrient exchange. Physical resistance to root growth can also occur with high soil densities. In addition, while compaction may affect populations of soil organisms, its impact on tree growth is unknown.

Soil displacement is the movement or removal of surface soil (topsoil) by mechanical action. Its effect on plant growth depends on both the areal extent and the depth of soil removed. Displacement removes nutrients and soil organisms, and reduces available water and rooting depth. It can affect water infiltration and permeability rates. Soil displacement is different than soil "mixing." Mixing may or may not be detrimental. For example, partial log suspension during yarding can cause considerable surface soil mixing but is a light, shallow type of disturbance that is considered to have little or no negative impact, and in fact may actually promote conifer re-establishment.

Timber harvest and site preparation methods, together with soil conditions during operations, influence the degree of soil compaction and displacement. The yarding system used during harvest affects the amount of soil disturbed. The final amount of soil compaction or displacement created by ground-based yarding primarily depends on areal extent of yarding trails, soil moisture during yarding, number of passes over each trail, and amelioration practices used. The areal extent of detrimental soil compaction or displacement created by ground-based yarding can be minimized by utilizing designated skid trails that are restricted to a predetermined percentage of the harvest unit (Froehlich, et. al. 1981; Garland, 1982; BLM Compaction Guidelines, 1983).

Detrimental soil compaction created by mechanical site preparation can be minimized or avoided by utilizing a tracked backhoe or excavator and limiting the number of passes to two (forward and back) when soils are dry and most resistant to compaction. Tillage can fracture and significantly improve compacted soil. The degree of fracturing depends on the tillage equipment, operator skill, and soil and site conditions including soil texture, moisture, and coarse fragmented content. For example, Andrus and Froehlich (1983) reported fracturing of approximately 80 percent of compacted soils when properly designed winged rippers were used. Likewise, Davis (1990) reported bulk densities of compacted areas tilled with a self-drafting winged subsoiler were not significantly different than those in uncompacted areas. However, soil structure and pores are not returned to their natural condition by tillage. No research has been conducted that correlates the degree of fracturing and restoration of soil density with the restoration of growth potential.

The more a log is suspended during yarding with a cable system, the less the soils are disturbed, thus skyline systems generally disrupt less than high-lead systems (Dyrness 1967). It is unknown how the compaction and displacement that occurs from cable yarding affects tree growth. The amount of soil compaction or displacement and associated tree growth loss created by mechanical site preparation varies with conditions, including soil type, amount of material to be piled, soil moisture, machine type, skill of operator, depth of organic matter layers, and the number of machine passes.

Soil Erosion and Mass Wasting (Landsliding)

Surface erosion and mass wasting are two types of soil erosion that affect the long-term productivity of forest soils. Both are naturally occurring geologic processes involving gravity, soil water, precipitation events, and other factors.

Surface soil erosion includes sheet, rill, gully, and dry ravelling, which results from the detachment and movement of individual soil particles or aggregates downslope. It is caused either by the energy of rainfall and running water acting on bare soils, or by surface disturbance of steep slopes. In some of the higher elevation areas, freezing and thawing, especially on a daily basis, can cause considerable erosion on disturbed ground. This is particularly apparent in road cutbanks and areas with exposed soil.

Mass wasting (landsliding) is the downslope movement of soil and rock material. Volume of mass wasting events can range from a few cubic feet to thousands of cubic yards. Some of the more important factors that contribute to soil/slope instability are steep gradient; low soil strength; declining root strength; shallow soil depth; road construction; and a high frequency, duration, and intensity of precipitation. Current, state-of-the-art road construction practices have dramatically reduced the landslide frequency rate from that of pre-1975 road construction practices.

Several distinct types of mass movement are recognized. Debris avalanches and debris torrents have many similarities; both occur on steep slopes, are fast moving, and are composed of soil, rock, water, and organic material. The two differ in that torrents are water-charged and occur in drainages, whereas avalanches lack the high water content and may or may not occur in drainages. Torrents and avalanches, the two most dangerous types of landsliding, usually produce the most dramatic onsite and off-site effects. Various slow moving types of mass movement such as shallow earth flows, rotational slumps, and deep-seated geologic events also occur. These are usually initiated by excessive water. Major concerns and impacts of mass wasting are public safety, private property, roads, bridges, water quality, and fisheries (see Chapter 4, Effects on Water Resources and Effects on Fish).

Hi-lead systems may disturb from 15 to 20 percent of the harvested area (Dymess 1967). Skyline systems generally disturb less than 10 percent of the area, and aerial systems affect less than five percent of the ground (Dyrness 1967). Compaction, displacement, and mixing are the primary yarding disturbances. The significance of displacement and mixing of surface soils and organic materials on long-term productivity is unknown.

Reduction in root strength following timber harvest and site preparation activities could possibly be a significant cause of landsliding outside the area of road construction. These changes match the high frequency of landslides the first few years following timber harvest on slopes with high potential for failure in western Oregon (Burroughs and Thomas, 1977). There are two types of landsliding: (1) translational, where the slip surface is relatively shallow, planar, and roughly parallel to the ground surface; and (2) rotational, where the slip surface is relatively deep and circular. Areas most sensitive to loss of root strength and subsequent translational-type landsliding usually are steep (70 percent or greater) slopes in concave positions over hard bedrock in areas of high rainfall. Rotational-type landslides are less sensitive to the root strength factor, but are sensitive to disturbances to soil and ground water and to natural slope configuration.

Nutrient Status

Soil organic matter accumulation and cycling are related to site index. When compared to lower site indices, higher sites have more organic matter incorporated into the soil and a larger nitrogen pool which makes their productivity usually more resilient. Conservation of organic matter is more important on low sites than on high sites for the maintenance of long-term productivity.

Harvest and site preparation intensities and frequencies influence the amount and composition of the surface organic layer. Conservation of small materials (e.g., needles, leaves, twigs) is important to total site nitrogen because these materials have the highest concentrations of nitrogen. When compared to needles and twigs, removal of large materials (i.e., stemwood and large branches) has less effect on total site nitrogen. However, the large materials are important for continuation of healthy symbiotic fungi populations (Maser et al, 1978).

Soil Biology

Soil organisms work continually in carbon cycling, nutrient transfer, water availability, vegetation vigor, and maintenance of soil structure (Power, 1989). Mycorrhizal fungi enhance nutrient up-take of host plants by increasing the absorbing area of roots through active physiological mechanisms (Amaranthus et al. 1989). When populations of soil organisms are healthy, few nutrients (e.g., nitrates) leach out of the system. The increased surface- absorbing area also directly increases the total soil volume that roots can explore for water. Soil organisms are responsible for most biological fixation of nitrogen in ecosystems. Certain bacteria and actinomycetes form a mutually beneficial relationship with host plants and convert (symbiotic fixation) atmospheric nitrogen into ammonium nitrogen which is released into the host plant's roots (Amaranthus et al. 1989). Specifically, red alder and associated bacteria (in the form of root nodules) can produce considerable amounts of nitrogen. Also, certain organisms that are not associated with host plants can convert atmospheric nitrogen (asymbiotic fixation). Some of these organisms are associated with wood-rotting fungi and mycorrhizal fungi (Amaranthus et al. 1989).

Mycorrhizae and other microbes affect soil structure by helping bind soil particles into water-stable aggregates with stable and adequate pore space. Soil pores are essential for adequate movement of water and air required by plant roots and soil organisms.

While available data is not complete enough to address what causes reductions in beneficial organism populations nor how reduced populations affect soil productivity, recent studies provide evidence for reasonable speculation. These studies suggest that long-term impacts to soil organisms can be reduced by implementing management practices that minimize soil disturbance severity, maintain soil organic matter levels, and emphasize revegetation by indigenous host species and associate soil organisms (Amaranthus et al. 1989).

FORCYTE-11 Model

The Coos Bay District used the FORCYTE-11 model developed by Dr. J.P. Kimmins and K.A. Scoullar through the University of British Columbia in the 1980s. The model, a hybrid historical bioassay and ecological process-based computer simulation, predicts forest yields under different management scenarios. It is a "nutrient driven" model that was designed to examine the effects of altering the nutrient status of a site. FORCYTE-11 can simulate the growth, yield, and nutrient cycling in a wide variety of forests.

The district has used FORCYTE-11 to estimate long-term productivity trends for various management practices addressed in the "Sensitivity Analysis of Timber Management Prescriptions of the Preferred Alternative." The trends developed are used only for relative comparisons because the model has not been validated against long-term experimental data.

The Oregon State University's Department of Forest Science used a combination of literature and inventory data to calibrate FORCYTE-11 for moist forest soils of western Oregon Douglas-fir sites. These data do not give a complete representation of all ecosystem processes but are the best presently available. Because research indicates that nitrogen is the limiting factor for most sites growing Douglas-fir in western Oregon, nitrogen was the limiting nutrient used in the FORCYTE-11 simulations. Vegetative growth in FORCYTE-11 is strongly influenced by available nitrogen.

FORCYTE-11 was used to estimate Douglas-fir total biomass production and site quality at an inherent, natural productivity level. This required three major steps:

1. An "initial ecostate" was developed which consisted of running several long rotations to a total of 900 years. Also, several light underburns and stand replacement burns were used to simulate natural conditions.

2. Next, a "baseline" production was determined. After the initial ecostate was developed, a series of eight 70-year (CMAI) rotations were run with no management applied. The production, in metric tons per hectare, was read directly from tables and graphs produced by the model. The average production per hectare per year was then calculated and used as the "baseline" number against

which all future simulations would be compared.

3. Finally, various management prescriptions, based on the planning alternatives, were run as simulations in FORCYTE-11. The results, in metric tons per hectare per year, of each simulation were then compared to the baseline. The percent difference between the baseline and a simulation was reported as a trend—maintaining, increasing, or decreasing.

The following procedures were used for estimating nitrogen-related growth effects due to various management prescriptions.

1. The estimate of total Douglas-fir biomass for the inherent productivity of a natural stand growing until CMAI was converted to mean annual production.

   Example: 5,234 metric tons (MT) per hectare (Ha), divided by four 70-year rotations (280 years).

   5,234 divided by 280 = 18.7 MT/Ha/Yr (baseline mean annual production)

2. FORCYTE-11 was used to estimate Douglas-fir total biomass produced by various management prescriptions. Total biomass figures were reported as mean annual production in metric tons per hectare.

   Example: Management prescription of three 80-year rotations with a light burn and pre-commercial thinning at 12 years.

   5,044 MT per Ha, produced over three 80-year rotations (240 years).

   5,044 divided by 240 = 21.0 MT/Ha/Yr. (mean annual production)

3. The mean annual production estimates were used to calculate percent change from the baseline (natural productivity) for the various timber management prescription simulations.

   Example: 21.0 (mean annual prod.), minus 18.7 (baseline), multiplied by 100, and divided by 18.7 (baseline) equals 12.3 percent.

4. The degree and direction of the productivity trend for each timber management prescription simulated was estimated by using the percent change from the mean annual production and the annual production from the last simulated rotation.

   Example: 19.1 (ann. prod. last rot.), minus 21.0 (mean ann prod.), multiplied by 100, and divided by 21.0 (mean annual prod.) equals a negative 9.0 percent.

5. The percent change from baseline productivity for each management prescription, and the percent change in the last rotation compared to the mean of the total evaluation time for that management prescription, were put into the following trend classes:

Maintaining:	Change is + or - <10%
Increasing:	Change is + 11 to 20%
Decreasing:	Change is - 11 to 20%
Strongly Increasing:	Change is greater than + 21%
Strongly Decreasing:	Change is greater than - 21%

Table IV-D-1 shows the long-term productivity trend classes for various timber management prescriptions, including some that would be used in the alternatives.

Table IV-D-1. FORCYTE - 11 Long-Term Soil Productivity Trends

Case Number	Management Prescriptions	Rotation Length (years)	No. of Rotations	Evaluation Time (years)	No Burn		Light Burn		Moderate Burn	
					Productivity -vs- Baseline	Productivity -vs- Last Rotation	Productivity -vs- Baseline	Productivity -vs- Last Rotation	Productivity -vs- Baseline	Productivity -vs- Last Rotation
1	No Treatment, High Stocking	80	6	480	Increasing	Maintaining	Maintaining	Decreasing	Maintaining	Decreasing
2	No Treatment, Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Decreasing	Strongly Decreasing	Strongly Decreasing
3	PCT Only, CMAI	80	6	480	Increasing	Maintaining	Maintaining	Decreasing	Decreasing	Strongly Decreasing
4	PCT Only	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining	Maintaining	Decreasing
5	1 Fertilization, CMAI	90	6	540	Increasing	Maintaining	Maintaining	Maintaining	Maintaining	Decreasing
6	1 Fertilization	150	4	600	Increasing	Maintaining	Maintaining	Maintaining	Maintaining	Maintaining
7	3 Fertilizations	150	4	600	Increasing	Maintaining	Increasing	Maintaining	Maintaining	Maintaining
8	3 Fertilizations, CMAI	90	6	540	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining	Increasing	Maintaining
9	PCT, 2 CT	80	6	480	Maintaining	Maintaining	Maintaining	Strongly Decreasing	Decreasing	Strongly Decreasing
10	PCT, 1 CT, CMAI	80	6	480	Increasing	Maintaining	Maintaining	Decreasing	Decreasing	Strongly Decreasing
11	PCT, 3 Fertilizations, CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining	Maintaining	Decreasing
12	PCT, 3 Fertilizations, 1 CT, CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining	Maintaining	Decreasing
13	Max. Timber, D & E with Debris Retention	70	8	560	Maintaining	Maintaining	Increasing	Maintaining	Maintaining	Decreasing

Table IV-D-1. FORCYTE - 11 Long-Term Soil Productivity Trends (continued)

					No Burn		Light Burn		Moderate Burn	
Case Number	Management Prescriptions	Rotation Length (years)	No. of Rotations	Evaluation Time (years)	Productivity -vs- Baseline	Productivity -vs- Last Rotation	Productivity -vs- Baseline	Productivity -vs- Last Rotation	Productivity -vs- Baseline	Productivity -vs- Last Rotation
14	Max. Timber @ 12" dbh	40	14	560	Decreasing	Maintaining	Strongly Decreasing	Decreasing	Strongly Decreasing	Strongly Decreasing
15	PA-Max. Timber @ 16" dbh[1]	60	10	600	Increasing	Maintaining	Maintaining	Maintaining	Maintaining	Decreasing
16	Max. Timber @ 20" dbh	100	6	600	Increasing	Maintaining	Maintaining	Maintaining	Maintaining	Decreasing
17	Max. Timber @ 24" dbh	180	2	360	Maintaining	Maintaining	Maintaining	Maintaining	Maintaining	Maintaining
18	PCT, 2 CT	300	2	600	Decreasing	Maintaining	Decreasing	Maintaining	Decreasing	Maintaining
19	PA-PCT, 2 Fertilizations, 2 CT, Corridors [1]	150	4	600	—	—	Maintaining	Maintaining	—	—
20	PA-PCT, 2 Fertilizations, 2 CT, OGEA [1]	300	2	600	—	—	Maintaining	Maintaining	—	—

The percent change from the baseline level or last rotation for each management prescription was categorized into the following trend classes:

Maintaining: Change is + or = <10%
Increasing: Change is +11 - 20%
Decreasing: Change is - 11 - 20%
Strongly Increasing: Change is + >21%
Strongly Decreasing: Change is - >21%

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[1] Proposed Action prescriptions on intensively managed areas, corridor management areas, and old-growth management areas, respectively.

Appendix IV-E
Watershed Condition Index Methodology for Analysis of the Alternatives

Introduction

Projections of the watershed condition index (WCI) at the end of the decade were obtained by subtracting expected natural recovery from the existing condition WCI values (Appendix III-E), and then adding additional impacts expected to result from management activities on BLM-administered and non-BLM-administered lands.

The drainage density, flow, landslide, mining, precipitation, slope, and soil indices of the WCI were held constant for the ten-year analysis. The calculation methods used for the other four indices (soil disturbance, vegetation, silvicultural, and riparian) are described below. References to "existing" refer to conditions at the time the initial analysis was completed.

Soil Disturbance Index (SDI)

For the 10-year scenarios, existing non-recovered acres of the various yarding methods were decreased by a recovery factor of 1.25 percent per year, for a 12.5 percent reduction over the decade. To obtain the total area of expected disturbance by harvest, the number of acres of BLM-administered land projected for harvest by yarding method under each alternative was multiplied by the estimated percent of canopy cover to be removed. The acres of merchantable timber on non-BLM-administered lands was derived from a point-intersect inventory method on aerial photos or the GIS Gross vegetation theme (selected for subject heavy timber) and then multiplying that figure by 50 percent to estimate projected harvest. For this analysis, new harvests on non-BLM-administered lands were assumed to be logged using the following yarding method distribution: 50 percent for no-suspension cable; 25 percent for one-end suspension cable; 20 percent for full-suspension cable; and 5 percent for unrestricted tractor.

Acres of new roads by surface type (e.g., paved, rock, and dirt) were added to the existing roaded acres. No recovery factor was included for previously existing roads. Additional acres were added to consider non-BLM roads needed to harvest estimated non-BLM merchantable timber; these acres were based on the equivalent acre rate and surface type distribution on BLM-administered lands, multiplied by the non-BLM projected harvest.

The acres of existing condition (minus 10-year recovery) and the non-BLM harvest acres remain constant across all alternatives; only the area that would be disturbed by BLM harvest and proposed roads varies.

Modification to the SDI formula (Appendix III-E) used to analyze the alternatives is as follows:

P = Acres of existing paved roads, plus acres of proposed paved roads for the given alternative.

R = Acres of existing rocked roads, plus acres of proposed rocked roads for the given alternative, plus equivalent acres of rocked roads for non-BLM-administered harvest.

D = Acres of existing dirt roads, plus acres of proposed dirt roads for the given alternative, plus equivalent acres of dirt roads for non-BLM-administered harvest.

T = Acres of existing unrestricted tractor harvest, multiplied by 0.875, plus acres of proposed BLM-administered unrestricted tractor, plus acres of projected non-BLM-administered unrestricted tractor.

N = Acres of existing no-suspension cable, multiplied by 0.875, plus acres of proposed no-suspension cable, plus acres of projected non-BLM-administered no-suspension cable.

C = Acres of existing one-end suspension cable, multiplied by 0.875, plus acres of proposed one-end suspension cable, plus acres of projected non-BLM-administered one-end suspension cable.

Vegetation Index (VI)

For the vegetation index, the acres of meadow, grass, pasture, brush, disturbed ground, agricultural areas, and cultural development were held constant for all alternatives. The following assumptions were also made:

- There would be a five-year lapse between harvest and replanting on non-BLM-administered lands.

- BLM would have five years from sale date to replant; estimated replanting would occur within two or three years after actual harvest. For this analysis, all BLM harvests were assumed to occur in the last five years of the decade; at the end of the ten years, all new BLM harvests would still be in the 0 to 3 age class.

- Non-BLM harvests would occur at a steady rate for all 10 years.

Using these assumptions, new harvests entering the 0 to 3 age class would remain in that class for approximately eight years (five years at age 0, plus three more years to move into the 4 to 8 age class). This averages 12.5 percent of the total 0 to 3 age class moving into the 4 to 8 class each year. Under these assumptions, after 10 years, 37.5 percent of today's 0 to 3 age class would be in the 4 to 8 age class, 50 percent would be in the 9 to 12 age class, and 12.5 percent would be in the 13 to 20 age class. In ten years, 100 percent of the existing 4 to 8 age class would be 13 to 20, 50 percent of the existing 9 to 12 age class would be 13 to 20, and all existing 13 to 20 age class would be greater than 20.

Acres of each forest age-class at the end of the decade were calculated and entered into the VI formula (Appendix III-E) as follows:

FO 0 to 3 (Acres of forest 0 to 3 years) = Projected non-BLM harvest acres, multiplied by 0.82, plus proposed BLM harvest acres for the given alternative.

FO 4 to 8 (Acres of forest 4 to 8 years) = Projected non-BLM harvest acres, multiplied by 0.18, plus acres of existing age 0 to 3 multiplied by 0.375.

FO 9 to 12 (Acres of forest 9 to 12 years) = Acres of existing age 0 to 3, multiplied by 0.5.

FO 13 to 20 (Acres of forest 13 to 20 years) = Acres of existing age 0 to 3, multiplied by 0.125, plus acres of existing age 4 to 8, plus acres of existing age 9 to 12, multiplied by 0.5.

Silvicultural Index (SI)

On BLM-administered lands, ratios were calculated from SYU and districtwide totals of each practice by alternative, then applied to each analytical watershed taking into account acres of commercial forest land, proposed regeneration harvests, and constraints within the watershed; the end result was an estimation of acres of each silvicultural practice by alternative for the watershed. The assumed duration of potential impact for the various silvicultural methods is: burning and herbicide treatments, a two-year effect; fertilization treatment, one-year effect; and precommercial thinning, a five-year effect, as in the current condition. Existing tractor-piled areas were decreased by a recovery factor of 1.25 percent per year, for a total of 12.5 percent decrease over the decade. Another assumption made for the decade was that 25 percent of areas subjected to unrestricted tractor harvest on both BLM-administered and non-BLM-administered lands would have logging slash piled, and that the other 75 percent of non-BLM projected harvest areas in AWS's would be burned. The acres of fertilization, herbicide treatments, and precommercial thinning for non-BLM-administered lands were estimated using projected harvest rates in AWS's and equivalent acre rates in AWS's from the current condition for the various silvicultural treatments.

Modification to the SI formula (Appendix III-E) for analysis of the alternatives:

T = Existing tractor-piled acres, multiplied by 0.875, plus proposed BLM tractor-piled acres under the given alternative, multiplied by 0.25, plus projected non-BLM tractor-piled acres, multiplied by 0.25.

B = Proposed BLM acres to be burned under the given alternative in the decade, multiplied by 0.2, plus 75 percent of the non-BLM acres burned in the AWS in the decade, multiplied by 0.2.

H = Proposed BLM acres to be treated with herbicides in the AWS in the decade, multiplied by 0.2, plus the projected non-BLM acres to be treated with herbicides in the AWS in the decade, multiplied by 0.2.

F = Proposed BLM acres to be treated (fertilized) under the given alternative in the AWS in the decade, multiplied by 0.1, plus the non-BLM acres to be treated (fertilized) in the AWS in the decade, multiplied by 0.1.

P = Acres of BLM pre-commercial thinning under the given alternative in the AWS in the decade, multiplied by 0.5, plus non-BLM estimated pre-commercial thinning acres, multiplied by 0.5.

Riparian Index (RI)

Since all alternatives proposed essentially to retain the riparian zone in all BLM-administered third order and larger streams, no measurable impacts were expected to occur and no new acres of minimal condition were calculated. Future impacts to riparian vegetation on non-BLM-administered lands were projected estimating the percent of non-BLM harvests which would occur along streams by order, then estimating disturbance by looking at both past practices and future impacts expected to occur from harvest activities under Forest Practice Rules for the Southwest Oregon Region. Only third order and larger streams were evaluated for riparian impacts to be consistent with the current condition analysis. The estimates for non-BLM-administered lands by stream order were added to calculate the number of acres of new riparian harvest in the watershed. For this analysis, all new riparian harvest was assumed to occur in areas with a riparian rating of class 4, meaning good/optimal condition.

Natural recovery of riparian vegetation over the 10-year period was assumed as follows:

- 33 percent of the area in the seedlings and saplings category or minimal condition class (Rating 1) would move into the pole timber category or fair condition class (Rating 2);
- 33 percent of the pole timber or fair condition class (Rating 2) would move to small saw timber or good condition class (Rating 3);
- 12.5 percent of the small saw timber or good condition class (Rating 3) would move to large saw timber or good/optimal condition class (Rating 4).

Modification to the RI formula (Appendix III-E) for analysis of the alternatives:

Rating 1 = Acres of new riparian harvest under the given alternative, plus Existing "minimal" acres, multiplied by 0.667.

Rating 2 = Existing "minimal" acres (Rating 1), multiplied by 0.333, plus existing "fair" acres, multiplied by 0.667.

Rating 3 = Existing "fair" acres (Rating 2), multiplied by 0.333, plus existing "good" acres, multiplied by 0.875.

Rating 4 = Existing "good/optimal" acres, plus existing "good" acres (Rating 3), multiplied by 0.125, minus the acres of new riparian harvest under the given alternative.

Riparian acres in "good/optimal" condition class meaning mature timber (Rating 4) are not used in this calculation except to determine total acres of riparian area; areas in the "good/optimal" category are assumed to have little negative impact.

Appendix IV-F

Dead-and-Down Woody Material Analysis Technique

The following method was used to predict future levels of dead-and-down woody material in the absence of empirical data on the current situation.

Effects of the alternatives on dead-and-down woody material were conducted for the short term only, and limited to BLM-administered land. Predictions of dead-and-down material on private lands and beyond 10 years were considered too speculative and were not included.

Assessment Method

Assumptions:

a) Natural stands (unlogged), on the average, represent natural potential for species using down logs. The average amount of down log habitat from inventory data in the Coos Bay District is 27 tons per acre.

b) Areas logged (clearcut) during the 1970s and 1980s have minimal habitat values due to gross yarding, growth of the chip market, and development of increased fire management expertise.

c) Areas logged (clearcut) prior to 1970 should generally have more habitat than post-1970 logging.

d) Mortality salvage, commercial thinning, and partial cutting have less impact than clearcutting.

Analytical Techniques

a) Data development

Step 1. Tally all acres of natural stands (unlogged), all commercially-thinned acres, all mortality-salvaged acres, all partial cut acres, areas clearcut prior to 1970, and stands clearcut during the 1970s and 1980s. Enter tallies in Table IV-F-1 (Column 2).

Step 2. Using the expertise of local reforestation, fire management and cruising personnel, estimate tonnage of residual down logs for each of the categories listed in Step 1. Enter estimates in Column 3 as percentage of the 27-ton median for unlogged stands.

Step 3. For analysis of future situations, enter tons per acre objective (Column 3) for residual down logs for clearcuts made between 1990 and 2000. (Express as decimal proportion of 27-ton median for unlogged stands.)

Step 4. Multiply acreage figures (Column 2) by factors (Column 3).

Step 5. Sum acres (Column 2).

Step 6. Sum results of factor (Column 4).

Step 7. Divide sum of factors (Column 4) by sum of acres (Column 2) and convert to percentage. The percentage calculated equals the index to log-dependent species.

Table IV-F-1. Analysis of Dead-and-Down Wood Material (Example)

Col. 1 Stand Category	Col. 2 Acres	Col. 3 Index Factor	Col. 4 Col. 2 x Col. 3
Unlogged		100%	
Commercially-Thinned			
Mortality-Salvaged			
Partial Cut			
Clearcut (Prior to 1970)			
Clearcut (1970-1990)			
Clearcut (after 1990)			
Total			
Analysis			

The Sum. of Col. 4 divided by the Sum of Col. 2 equals the Index.

b) Data Analysis

The following standards are used to analyze the results:

- Optimal if index value is 80 to 100 percent.
- Good if index value is 60 to 79 percent.
- Fair if index value is 40 to 59 percent.
- Minimal if index value is 20 to 39 percent.
- Non-viable if index value is less than 20 percent.

Appendix IV-G

Assessing Effects on Wildlife - Analytical Techniques

What assessment method will be used to determine how the RMP alternatives would impact important wildlife habitats and populations?

Roosevelt Elk

Subquestion I. What method should be used to analyze impacts on Roosevelt elk habitat and populations? How should the selected model be used to analyze alternatives?

Two approaches, the Wisdom Model and Cover/Forage Ratio, were considered in the 1988 Proposed State Director Guidance. The preferred method is the Wisdom Model which has been accepted for application to forest-wide planning by an interagency task force including the U.S. Forest Service and including BLM, Oregon Department of Fish and Wildlife, and the Washington Department of Wildlife. The task force developed guidelines for using and fine-tuning the model. BLM computed values for three habitat effectiveness indices rather than compute a geometric mean as used in the Wisdom Model. The basis for this difference is that the geometric mean has been criticized for its tendency to give a narrow range of habitat effectiveness values. In addition, analytical techniques presented in this appendix have more detail than the 1988 proposal as a result of knowledge gained while testing the technique.

Assessment Method

Wisdom et al., A Model to Evaluate Elk Habitat in Western Oregon.

Assumptions/Comments:

a) Vegetation data on adjacent private lands are adequate to assess cumulative effects.

b) Evaluations will be conducted for each analytical watershed or elk management area with substantial existing or potential elk use where BLM has at least 25 percent management control. Watersheds with less than 25 percent BLM management control may be analyzed if BLM-administered land is important to elk management.

c) See Wisdom et al. (p. 11) for a complete list of assumptions pertinent to use of the model.

d) Use the following forest stages as a guide (ages for each category are typical and may vary due to differences in forest types and management regimes):

Forage areas = 0 to 20 years
Hiding cover = 21 to 50 years with appropriate stocking classes
Thermal cover = 51 to 160 years with appropriate stocking classes
Optimal cover = over 160 years with appropriate stocking classes

Analytical Techniques:

a) Divide the land base into analytical watersheds (GIS Map AWS), or elk management areas (ARD Map M69), using 30,000 to 50,000 acres as a guide.

b) Integrate information from the FOI theme for forest operations inventory on BLM-administered land, and from Gross Vegetation theme for non-BLM-administered land to calculate effectiveness indices.

c) Refer to Wisdom et al., publication for details on use of the model (p. 23-31); in summary, the technique involves calculation of three habitat effectiveness indices including density of roads open to motorized vehicles, cover quality, and forage quality.

d) Calculation of Road Density Index (HEr):
   1) Overlay Transportation theme (TRB) and Analytical Watershed (AWS) theme. Use the LPOVER and Length commands in MOSS to determine road length. Divide road length by area to get road density.

e) Calculation of Cover Quality Index (HEc):

   1) Use HEC attribute in MICRO*STORMS to determine acres of hiding, thermal, and optimal cover by quality classes (see assumption "d" above).
   2) Use the heavy timber subject (VHT) on the Gross Vegetation theme (consider VHT to include closed canopy stands) to estimate acreages of hiding, thermal, and optimal thermal areas on non-BLM-administered land. Consult with the U.S. Forest Service and private industry personnel on these estimates. To estimate additional acres of hiding cover on non-BLM-administered land, use the following subjects from the Gross Vegetation theme: VSG (second growth), VB (brush) and 0.5 VST (scattered trees).

f) Calculation of Forage Quality Index (HEf):

   1) Use the HEf attribute in MICRO*STORMS to determine acres of forage by quality classes as described in Wisdom Model (p. 29).

g) For analysis, trends for the three habitat indices were estimated for BLM-administered land only because predictions would be too speculative for private land. To estimate HEc, HEf and HEs indices, use output from ASQ runs. The HEc index can be derived directly from age-class distributions derived from ASQ runs. The HEf index can be estimated by projecting the amount of clearcutting in the future and consulting with forestry staff on expected trends in forage seeding, burning, and fertilization. The HEr index can be estimated by reviewing development of the 10-year timber management scenarios.

h) In a narrative, discuss long-term cumulative effects.

Display Techniques:

a) Display calculated habitat values for each analytical watershed or elk management area in tabular form.

Snags

Subquestion II. What method should be used to predict the number of snags that would be available for each alternative, and how does this relate to changes in population levels of cavity-users?

Two methods were considered in the 1988 Proposed State Director Guidance (optional methods 1 and 2). Since results from the two methods were roughly equivalent, only the first option was retained. An additional change was to drop reference to management for 20 percent of the potential population levels of dominant woodpeckers (e.g., downy woodpecker, hairy woodpecker, red-breasted sapsucker, pileated woodpecker, and northern flicker) in clearcuts.

Assessment Method

Neitro et al, method to analyze multiple species snag requirements (described in Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington edited by E. Reade Brown, 1985).

Assumptions:

a) By managing for dominant woodpeckers, requirements of other cavity-users would be fulfilled.

b) There is a direct correlation between snag densities and population densities of cavity-users.

c) The following minimum guidelines have been established for most alternatives (except alternatives where minimum standards of Oregon Forest Practices Act rules apply):

- Wildlife trees will be greater than 10 inches dbh and at least 20 feet tall; no more than five percent of the trees left will be under 15 inches dbh, at least five percent of the trees left will be over 30 inches dbh, and the remainder will be over 15 inches dbh.

- All soft snags will be left except where unacceptable for safety, logging systems, or burning considerations.

- Hard snags will be left (or green trees if needed) for snag mitigation purposes, to provide the current needs of hard-snag-dependent species and also serve as a source of future soft snags.

- Hard snags will be distributed according to the following criteria: In harvest units, retain the number of hard snags or green trees to support the desired population of dominant woodpeckers (either individually scattered, or in clumps larger than two acres); retain all hard snags in areas reserved from timber harvest (e.g., nonsuitable woodland, protected old-growth/spotted owl, riparian, bald eagle).

Analytical Techniques:

a) Estimate existing snag levels for each forest age class. These snag levels may be estimated from projections of snag densities currently being measured on timber inventory plots (or by using other data already collected including snag data from literature sources). Snag densities are presently being determined for the following conifer age classes: 1 to 30, 40 to 80, 90 to 190, and over 200. Hardwood stands are also being measured. See BLM's Forest Inventory Field Instructions for Western Oregon for further details. Snag densities for other habitats, such as nonsuitable woodlands and riparian management areas (RMA), may be estimated from timber inventory plots (or by use of other data if available) if age classes are known.

b) Estimate snag densities for each age class for the range of alternatives after evaluating the strategy of each alternative to provide habitat for cavity dwellers.

c) Convert calculated snag densities into district-wide estimates of potential population levels (percent of maximum population levels) of dominant woodpeckers for each alternative (see Neitro et al., p. 145).

d) Conduct analysis for both the short term and long term (100 years).

e) In a narrative, discuss cumulative effects of the alternatives on cavity-users.

Display Technique:

a) Display estimated population levels of dominant woodpeckers at the end of 10 years and the end of 100 years.

For a discussion of analytical techniques used in assessing dead-and-down woody material, see Appendix IV-F.

Appendix IV- H

Methodology for Assessing Effects on Fish Habitat and Populations

Assumptions

1. Stream inventory data is available.
2. Fish species distribution is accurate based on current ODFW and BLM surveys.
3. Fish density, survival, and exploitation estimates are provided through consultation with ODFW.
4. Riparian tree sizes (from the Operations Inventory) are directly related to habitat quality and fish populations, assuming other factors (e.g., water diversion or sedimentation) are not limiting.
5. Streams are fully seeded (i.e., adequate number of adult fish) under short- and long-term population estimates.
6. Food supply is directly linked to habitat quality rating.

Analytical Techniques

The habitat quality model which rates stream reaches as minimal, fair, or good/optimal requires an estimation of species population carrying capacity. The following steps were followed to develop the information for the fisheries portion of the RMP/EIS.

1. Identify all fish inhabited reaches and segregate by species (use reach attributes to identify every reach).
2. Determine the expected short- and long-term habitat quality rating for each reach.
3. Using the habitat quality rating, estimate the smolt production capacity for each anadromous species by reach. Summarize reach data for the district.
4. Develop population estimates in consultation with ODFW personnel for basins within the planning area.
5. Using projected habitat changes, estimate a long-term and a short-term trend for both the habitat and the population.
6. When assessing the quality of habitat, base the primary rating upon the average tree size (dbh) in the riparian area. However, a related factor analysis could be conducted to determine if other factors are affecting the quality of the reach. Examples: Withdrawal of water for irrigation, or heavy sediment yield in a watershed, may lower a rating based on large tree size. Rehabilitation/enhancement with structures may raise a rating based on small tree size. The availability of abundant natural structure, beaver dams, or side channels may also raise the rating of a reach.

Smolt densities were determined collectively with the Oregon Department of Fish and Wildlife. Considerable natural variability in fish production occurs between years and between streams. For example, a 20 percent variability in coho smolt production occurred in Deer Creek on the Salem District during different years, and the observed range of coho smolts produced per mile in different streams was 453 to 2,110 (Beidler, et al, 1980) due to different habitat conditions (e.g., stream width, gradient, percent pools). Smolt densities were developed according to the stream order and reach quality of a reach area using the smolt production factor in Table IV-H-1.

Smolt survival to adults by species was determined using survival rates in Table IV-H-2.

Table IV-H-1. Smolt Densities By Habitat Quality Ratings

		Factor to Determine Smolt Production/Square Foot		
Species	Stream Order/ Gradient	Good/ Optimal	Fair	Minimal
Coho salmon	2-6/0-3%	0.028	0.014	0.007
	2-5/3%+	0.00	0.00	0.00
	7-9/0-3%	0.003	0.002	0.001
Steelhead	2-5/0-3%	0.003	0.002	0.001
	2-5/3%+	0.007	0.004	0.002
	6-9/0-3%	0.002	0.001	0.0005
Cutthroat trout	2-5/0-3%	0.0015	0.001	0.0005
	2-5/3%+	0.0035	0.002	0.001
	6-9/0-3%	0.001	0.0005	0.00025

		Smolts (migrants)/ft		
		Good/ Optimal	Fair	Minimal
Chinook salmon				
Spring chinook	Any stream reach used annually as spawning and rearing habitat.	0.011	0.006	0.003
Fall chinook	Any stream reach used annually for spawning and early rearing; usually 4th order and higher streams with less than 3% gradient.	0.04	0.02	0.01
Spring and fall chinook	Any stream reach used by spring and fall chinook; average smolt production value was used.	0.026	0.013	0.006

Table IV-H-2. Smolt Survival & Exploitation (Fishing) Rates

Species	Percent of Population Smolt Survival to Adult	Fishing Rate[1]
Coho	7.5	69
Steelhead	10.0	30
Cutthroat	30.0	20
Chinook		
Spring	10.0	60
Fall	9.0	60

[1] The percentage of adult fish caught through commercial and sport fishing.

Appendix IV-I

A Spatially Explicit Life-History Simulator for the Northern Spotted Owl

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June 16, 1992

Introduction

The probability of an organism surviving a specified time interval is the product of the probabilities of surviving a series of discrete risks distributed across that interval: the risks include predation, starvation, exposure to the elements, and disease. Similarly, the probability of an organism successfully reproducing is linked to the ability to find a mate, the risks to the offspring, and the metabolic constraints imposed on the adults. The fundamentals of both birth and death processes are therefore based on the environmental properties of the area in which the organism exists and to its proximity to potential mates. To survive in a heterogeneous environment, an organism preferentially inhabits habitat favorable to its survival and avoids barren or dangerous areas. The animal's movement and response to environmental heterogeneity is therefore evolved to exploit the use of available resources so as to maximize lifetime reproductive output.

Habitat dependencies for survival and reproduction are fundamental to population ecology, and yet they are seldom incorporated into population models. In traditional modeling, these relationships are largely ignored. Mating efficiency, survival to first breeding and the metabolic status of the parents are all, for example, encompassed by two parameters: the observed birth rates and prereproductive survival rates. Given just these parameter estimates all of the complexities associated with the interface between the organism and the environment are lost. If the habitat remains constant, this is an acceptable simplification. however, management activities and disturbance events alter the habitat in which the organism exists, then the interface between the organism and its environment must be modeled explicitly. In forestry, for instance, management consists primarily of vegetative manipulation resulting in habitat change. Forest management, from a wildlife standpoint, is a vegetation treatment experiment in which wildlife population levels are important dependent variables.

To project the impacts of land management activities, models must relate population demographics explicitly to the landscape in which the organism exists. Otherwise, there can be no assessment of the potential impact of a change in landscape pattern. In addition, if the pattern of manipulation leads to a fragmented system, then the spatial relationships between the various treatments must be explicit as well.

A spatially explicit model that directly links habitat variation to demographic variation is therefore essential to assess population viability. In addition, such a model allows the efficacy of various landscape patterns to be tested and provides a means to explore interactions between the distribution, amount and quality of habitat and population dynamics (Urban et al. 1988, Pulliam et al. unpublished) . In this type of model, habitat quality is defined in terms of demographic parameters. Habitat is 'suitable' for an organism if organisms that utilize that type of habitat either have high survival rates, high birth rates or both. In particular, suitable habitat can be defined as habitat in which the combination of birth and death rates allows for a stable or increasing population.

The northern spotted owl (*Strix occidentalis caurina*), is a habitat specialist that utilizes late-seral-stage forests (Thomas et al. 1990). The acreage in these timber types has declined rapidly since the late 1940's, due primarily to high levels of timber harvest (Thomas et al. 1990), and the pattern of harvest on the landscape has lead to a high degree of fragmentation in the remaining habitat. The spotted owl is a monogamous breeder, territorial, with large (>1000 ha) home ranges (Thomas et al. 1990, Appendix I), and obligate juvenile dispersal. Juvenile dispersal ability is limited; the longest published straight-line juvenile dispersal distance is 62 miles (100 km) (Thomas et al. 1990, Appendix P, Table PI) . Given obligate dispersal and uncertainties associated with mate finding, it is likely that isolation and fragmentation on the scale of the home range will have an impact on the ability of dispersing owls to colonize new territories and form breeding pairs.

The Model

A spatial model was created to simulate the impact of forest management on populations of the northern spotted owl. The basic premise of the model is that an organism's survival and reproduction can be linked explicitly to its immediate habitat and that habitat's context within the larger landscape. That is, a population's rates of survival and fecundity will vary based on map configuration. In addition, the model allows for habitat areas that are unsuitable or marginally suitable for nesting. Lastly, the model assumes that each organism must search the landscape to find a mate.

The model is a single-organism simulator. Each organism is born, moves, attempts to find a mate and breed, and dies. This format allows the behavior of each individual to be simulated by following a series of probabilistic rules rather than through the abstraction of an equation set. The model is flexible, allowing for the analyses of individual characteristics as well as population dynamics. The average distance moved by individual birds before death or pairing, for example, can be output, and thus compared with data from banding or telemetry studies to determine if the simulated movement produces a path-length similar in magnitude to the observed behavior.

Model Details

Life History

The model partitions owls into classes based on age, sex, and breeding status. Because it is not possible to determine the age of adult ($\geq$ 2 years of age) owls in the field, a stage-structured modeling approach (Lefkovitch, 1965, Caswell 1989, Thomas et al. 1990: Appendix L) has been adopted. Both sexes are modeled, with birds partitioned into three stage classes: first year birds (juveniles), second year birds (sub-adults), and birds older than two years (adults). Two classes of paired birds are recognized, sub-adults and adults (Fig. 1). A sub-adult pair is defined as a pair containing at least one sub-adult bird. The age of first breeding is at 1 year, with one-year-old birds given a lower fecundity rate than older birds.

Males

Males are born and disperse from the nest site looking for acceptable habitat to set up a territory. Determination of site suitability is a probabilistic process. As the site quality decreases, the probability that a male will decide that a site is suitable also decreases. The probability that a male becomes territorial on a site of a given quality is referred to here as the settling rate. If a suitable nest site is found, males stop moving and become territorial. Territorial males remain on this site until they die or the site becomes unsuitable for nesting. If the site becomes unsuitable, then the males become non-territorial and reinitiate search (Fig. 2).

Females

Females are born and disperse from the nest site looking for territorial males. When they find a territorial male, they obligately pair (Fig. 3). Once paired, females remain on the site until they die or the site becomes unsuitable for nesting.

Pairs

Pairs split up only when one member of the pair dies, or the site becomes unsuitable for nesting. If the female dies, the male remains territorial and stays on the site. If the male dies the female has no fidelity to the site and will initiate searching for a new mate (Fig. 4). If the site becomes unsuitable for nesting, both members search for a new site independently.

Movement from one age-class to another

As owls age, they move from juveniles to sub-adults and finally to adults. Survival probabilities are evaluated at each movement step within the annual interval and remain constant throughout the year. At the end of the year all birds still alive move to the next stage. Years start at the birth pulse.

The impact of shifting vegetation patterns on life-histories

In the model, changes in habitat quality can be made at the start of any annual cycle. If these changes result in the previously suitable occupied sites becoming less suitable, then the territorial status of the owls occupying those areas may be changed. Territorial males, whether paired or not, become nonterritorial at a rate of (i - the specified settling rate) for the land classification. If the males are paired and remain territorial, then the pair remains intact. If not, the pair breaks up into a non-territorial male and a female, and both birds begin independent search for new habitats. All owls will immediately be subject to the probabilities of survival and fecundity associated with the altered landscape.

Survival

Mortality is assumed to result from either starvation or predation, and these factors are assumed to be additive. Both factors are linked to site. Total risk is simply (I - survival probability). Survival probability is evaluated based on habitat quality of the site currently occupied. Because risks are assumed to be constant over the course of the year, if the year is broken up into i time-steps, the risk per step for an owl in stage j occupying habitat type k is defined as:

$$Rt = 1 - (1 - R_{jk})^{1/i}$$

where Rt is the Risk per time step and Rik is the yearly risk as defined for age class j and habitat class k. In pairs, the survival of each member is determined by their stage as well.

Movement

The map is divided into a fixed array of grid cells, each cell representing one territory-sized unit. The grid is hexagonal to allow more realistic movement than is provided by a square grid (Pulliam et al. 1992, Lamberson and Voss, Personal communication). The rate of movement is dependent on the size of the grid cells and the number of time-steps per-year. Individual moves are restricted to adjacent cells. All of the mobile classes of owl (nonterritorial males and females) have the opportunity to move at each time-step. To ensure that certain birds or areas of the map are not given preferential access to open territories or mates, the order of movement is fully randomized at each time-step.

The model allows owls to search with 'intelligence'; that is, they may favor movement through good habitat and avoid bad habitat. Similarly, females move obligately to known territorial males and non-territorial males may be averse to crossing defended territories. This intelligent behavior is modeled by giving the owls absolute knowledge of the cell that they occupy and incomplete knowledge concerning the immediately adjacent cells. They have no knowledge concerning more distant habitat. This knowledge takes the form of a series of switches and weighing factors that condition the probability of movement (table 1).

The movement controls can be broken down into four types. The first is a simple switch. In this case, if the criteria are correct, behavior is obligate. The second is a probabilistic switch. In this case, switching is performed with a certain probability if the criteria are correct: the behavior is obligate but the knowledge is not absolute. The process of females finding mates in adjacent cells, for instance, is a probabilistic switch. The logic is to simulate events such as a female being attracted by the vocalizations of a neighboring, unmated male.

The third control type takes the form of weighing factors. In this case, knowledge is assumed to be absolute, but the behavior is not obligate. Vegetation characteristics affect owl behavior by weighing the likelihood that an owl will move in a particular direction. Weighing factors work in the following manner. At each time step a dispersing owl can move into one of six adjacent cells or may remain in its current cell. The probability of movement into any cell is therefore initially 1/7. This initial probability is then multiplied by each of the weighing elements. The product of all the cell probabilities times all the weighing factors is then scaled to sum to 1.0, and a cumulative distribution is created. A uniform random deviate is generated and its position in the cumulative distribution determines which choice is taken (table 2, Fig. 6).

Lastly, the model can simulate a variety of behaviors at the map edges. Three boundary conditions can be specified: absorbing, reflecting and wrap-around.

Details of Movement Parameters

The following is a detailed description of the parameters listed in table 1.

1. Become territorial. This parameter specifies the probability that a male will choose a site having a specific habitat quality as an acceptable territory. If the male becomes territorial and is located by a female, pair formation is obligate. The model is very sensitive to this parameter because it effectively sets the carrying capacity of the landscape.

2. Aversion. A weighing parameter that determines the behavior of the owl when faced with a variety of potential habitat types in the adjacent cells. Higher quality sites therefore have a greater likelihood of being selected than lower quality sites.

3. Site fidelity. A weighing parameter that influences the owl's decision to remain in the existing cell rather than to moving into adjacent cells. This parameter is similar to aversion in intent, but aversion only has an influence if there is a choice. An owl completely surrounded by poor habitat will have no criteria by which to choose and the choice will be purely random. Setting a low site fidelity to poor habitat will, however, cause the bird to move through these areas more quickly.

4. Linear propensity. Sometimes called a straightening parameter, this weighing parameter works in the f ollowing manner: Each owl has a one-move memory; the direction that was taken in the last move will be multiplied times the directional weighing parameter. A large value will, therefore, make the owl move in a straight line. It should be noted that if the owl's last move was to stay put, the directional parameter will tend to make it stay put. This tendency can be compensated for by shifting the values of the parameter controlling site fidelity.

5. Territorial aversion. It is assumed that non-territorial males will avoid existing territories. This weighing parameter sets the degree of aversion.

6. Female finds male.
   a. Current cell. A switch - she obligately pairs.

   b. Adjacent cell. This parameter sets the probability that the female will find a male that is territorial in an adjacent cell. It is a probabilistic switch. If the value = 0, she will never find him. If the value is 1 she will always find him.

7. Boundary condition. Boundaries are treated as consisting of cells having special properties. In the case of reflecting boundaries, an owl at the map edge will have totally unsuitable land in those directions that lead off the map. When choosing a direction to move, the bird will show total aversion to the boundary and will never enter it. This method ensures that an extra move is not necessary to explore the boundary. In the case of absorbing boundaries, birds that cross the boundary are considered to be dead. In this case, the boundary is defined in terms of the adjacent cells within the map. Wrap-around boundaries can be thought of as a proxy of an open system. A bird that exits one edge re-enters on the opposite side of the map. In this case the boundary is defined in terms of the habitats that the bird will enter on the opposite side of the map.

Choosing a time-step

In this model, the probability of moving to an adjacent cell is a function of the condition of the local landscape and the biological propensities of the organism. Because transitions can occur at each time step, the number of time-steps per-year expresses an implicit rate of movement. Choosing the number of time-steps is not a casual process. Increasing the number of timesteps increases the velocity of travel. Choosing 40 steps rather than 20, for example, will double the potential number of territories that an owl can search. The critical question of scale involves the maximum possible dispersal distance before settling or death. The maximum recorded juvenile dispersal is 62 miles (100 km) (Thomas et al. 1990). If each hexagonal cell is 1000 ha in size, the distance across the cell is 1.96 miles (3.15 km). This would suggest 32 time-steps (64 miles) as possible appropriate yearly search distance. The probability of moving 64 linear miles in 32 time steps is, however, rather unlikely. In fact, in a pure random search the probability of taking 32 steps in the same direction on a hexagonal grid is almost zero (9xlO-28). The linear propensity (see above) would need to be set so high as to overwhelm all other movement considerations. The best way to determine whether a time-step is appropriate is to run the model using the desired movement parameters and compare the mean distance to death and distance to pairing produced by the model simulations to empirical data (Thomas et al. 1990:305, Table PI).

Fledging

Fledglings here refer to those that survive to disperse. It is assumed that there are good years and bad years for fledging. If it is a good year, then the pair produces fledglings according to a beta distribution ranging from zero to a specified maximum clutch size. There are therefore two levels at which variability can impact the number of fledglings. If the area of the beta distribution is concentrated close to the mean, then the population will pulse based on the frequency of good years. When a good year occurs, all of the pairs will produce about the mean number of fledglings. If the probability of a good year is set to 1.0, then variability in the number of fledglings will be on an individual nest basis and will be dependent on the shape of the beta distribution. The form of the beta distribution can potentially be unique for each land class and age class. Because this is a two-sex model, the sex ratio of fledglings is also adjustable.

Random number generation

Because all of the model dynamics are controlled by the generation of pseudo-random numbers, it is important to test the randomness of the generator. The random number generator utilized in the model has passed a series of standard tests (Appendix).

GIS interface

The model has a module that allows the user to generate maps for purposes of display and to analyze the effects of hypothetical landscape patterns on population dynamics. In addition, an automated link has been created between the model and vector-based Geographic Information Systems (GIS) to allow integration with actual vegetation maps. Using this link, a hexagonal grid with size appropriate to the home range of the species being modeled is intersected with the map and the area of discrete vegetation types contained within each hexagonal grid-cell is analyzed to determine habitat quality. This allows for a rapid translation of vegetation data collected on a stand-level into habitat quality on scale of individual owl home ranges. Maps generated through the GIS interface can be modified at the home-range level using the mapping facilities included in the model. Maps created by the model can also be transformed into vector-based GIS maps. This ability to move information freely between the GIS and the model allows a dynamic interaction between land management decisions and the potential impact of those decisions on owl populations. A manager can manipulate vegetation at the stand level within a GIS and evaluate the impact of those changes on owl populations. Model output such as mean pair occupancy for each cell (output as a map), based on a large number of simulations, can then be overlaid over the stand-level map to determine which stands correlate with areas displaying either high or low occupancy rates.

Results

The model was used to project population trends from five hypothetical landscapes with an identical number of suitable sites (Fig. 6-10). Other than habitat configuration, there were no differences in the initial values of any model parameters. The map boundaries were wrap-around so that the exact location of the habitat within the map frame was unimportant. The demographic parameters (Table 3) were set to yield a finite growth rate of 1.0 and were not modified by habitat quality. In these simulations only two habitat qualities were simulated: habitat suitable and habitat unsuitable for nesting. The movement parameters deviated only slightly from a random walk: birds were twice as likely to choose suitable habitat, males treated occupied habitats in a manner identical to unsuitable habitat, and birds were twice as likely to move in the same direction as to choose a different direction. These deviations from random behavior were chosen so as to improve search efficiencies on all maps. Extreme aversion to poor habitat will, for instance, be beneficial in highly grouped habitats since it will effectively confine the search to those areas that are acceptable for nesting. It is, however, detrimental in very dispersed systems since, in these systems, juveniles must cross poor habitat in order to explore the landscape. Weak selectivity will be beneficial in both systems. Strong habitat selectivity in juvenile dispersal is also not supported by dispersal studies (Gutierrez et al. 1985, Miller 1989) the literature. Similarly, a small increase in the linear propensity has the primary impact of preventing useless searching caused by doubling-back.

The effects of clustering

The model results support previous model results (Doak 1989, Thomas et al. 1990, Lamberson and Noon, unpublished) in showing that a clustered structure is both more efficient in terms of mean population level and more stable in terms of lowered extinction probabilities than is a random structure. A spatial analysis of mean pair occupancy demonstrated that the small degree of stability shown by the random system occurred in the upper left-hand portion of the map where the density of suitable territories, through random chance, was highest.

The effects of shape

The shape of reserve areas also has an important impact on their stability properties. A cluster with a low edge-to-area ratio (Fig. 8) is more stable than continuous clusters with identical area but with varying degrees of irregularity. (Fig. 9-10) The population trend for the large, highly irregular cluster (Fig. 10) is similar to the system of three small clusters (Fig. 7).

Source-sink relationships

The previous results demonstrate the impact of reserve configuration when each landscape cell is either suitable or unsuitable for breeding and the survival rates are constant for all sites. In actual landscapes, the habitat lies along a quality gradient, from ideal to totally unsuitable. Within this gradient, there will be source locations that, on average, produce an excess of individuals and sink locations into which some of these juveniles will settle. The choice of settling point may well be globally sub-optimal (Pulliam 1991). An organism has no means to ascertain the availability of habitat except through experience and exploration. In this model, this process is simulated by varying the settling parameter. This parameter, which only applies to males (see Fig. 2), defines the probability that a bird will settle and become territorial in the site that it currently occupies. To test the effects of a reserve design embedded in a landscape that is marginally suitable to one that exists in a completely unsuitable landscape, a small reserve system was created and simulations were performed using two rule sets (Tables 3,4). All parameters were the same except for the settling rate for areas exterior to the reserve.

The presence of marginal habitat adjacent to reserves can have a negative impact on the stability of the reserve system (Fig. 11,12). Even though the mean population size is larger in the source-sink system, the mean occupancy of the reserve clusters is lower and the variability of the system increases with time, leading to increased risks of extinction.

Discussion

An analysis of model behavior

A great deal of the behavior of any model is dictated by its structure, and this model is no exception. It is, in essence the sequel to a series of models originating with Lande's non-spatial deterministic model (Lande 1987, 1988), followed by dynamic versions in Thomas et al. (1990) and expanded in Lamberson et al. (in press) and Lamberson and Noon (unpublished ms).

This model differs from traditional stage structured population models (Begon and Mortimer, 1981; Getz and Haight, 1989) in many ways including the modeling of both reproductive and nonreproductive life history stages. In comparing a simple stage structured model with the landscape model (compare Figs. 1 and 13) pair survival differs because, in the spatial model, both members need to survive in order for the pair to survive. The probability of a pair breaking up is therefore one minus the square of the adult or sub-adult survival rate (Fig. 1).

Flow rates between the reproductive and non-reproductive stages depend on survival rates, but movement from the nonreproductive states into the reproductive classes is mitigated by the probability of pair formation (P(p)) (Fig. 1). As P(p) -> 0, entry into the reproductive population also -> 0, and the population will decline. As P(p) -> 1, the non-reproductive vector empties and the model collapses into the reproductive classes. P(p) is the parameter through which spatial relationships impact the life history of the organism.

P(p) is closely related to the probability of finding a suitable site. For males, a suitable site is defined by the cell's quality and occupancy status. For females, suitability is defined by the presence of a territorial male. Even though the criteria are different, the search process is similar.

In an unconstrained random walk, and allowing a fixed number of cells to be searched, the probability of searching a cell declines rapidly with distance from the point of origin (Fig. 14). If the total number of cells searched is increased, the probability of searching a cell increases slowly and asymptotically (Fig. 15). For this reason, distance dominates search probabilities (Fig. 15,16). The model is, therefore, reasonably insensitive to changes in search velocity and extremely sensitive to the spatial positions of the reproductive pairs in the landscape.

In the model, birds search with a fixed survival probability, rather than searching a fixed number of times as has been the case in other models (Lande 1987, Thomas et al. 1990, Lamberson et al. in press, Lamberson and Noon unpublished). This difference, however, is unimportant to the model dynamics: equivalent search functions can be generated using either approach (Fig. 17).

P(p) will decline if the population is high, because unoccupied sites will be scarce and will tend to lie in areas that are distant from large groups of reproductive pairs. P(p) will also decline if the population levels are low, because searching females will have difficulty finding territorial males. P(p) will decline as the population becomes more diffuse. As a result, any actions that cause the mean distance between reproductive pairs to increase will therefore always impact the finite rate of increase of the population.

Model behavior at high population levels is qualitatively similar to a logistic model. At low densities, however, the models diverge. The logistic model assumes that population response will be most robust (the ratio of birth/death will be largest) when the population is depressed. If search is explicitly modeled, there are positive benefits associated with density. When the density drops in the context of abundant habitat, territorial males may go unpaired due to the low density of females: females will not locate males and form pairs before they die. If, in addition, low population densities are associated with long distances between potential territories, as is the case when habitat is fragmented, then the ability of the males to find territories will be reduced as well. This model, and all of the models following Lande (1987) will therefore have threshold points defined by population density and degree of habitat fragmentation at which the population will collapse. Population instability has sometimes been introduced into traditional models by incorporating an 'Allee effect' (Allee 1931; Noy-Meir 1975), but the correct functional form and strength of this effect is not clear. In this model, the 'Allee eff6ctl occurs naturally as a direct result of search.

Fecundity

The population birth rate B is also affected by costs associated with search:

$$B = b * P(m) \tag{2}$$

$$P(m) + f(s,e,P(p)) \tag{3}$$

where

B is the population birth rate,
b is the measured birth rate for paired females,
P(m) is the probability that a female has a mate, and s is the adult survival rate.

P(m), represents the balance between pair break-up and pair formation. Pair break-up is a function of the adult survival rate which is based on site quality, and is assumed to be density independent (the presence or absence of adults on the same site or in adjacent sites has no impact on the parameter value) . The rate of pair formation is controlled by P(p).

If b is constant, then B will simply follow P(p). It is this decline in B that causes diffuse populations to collapse (Fig. 6) even when there are no decreases in survival probability associated with search.

Questions of scale

Fragmentation has the impact of altering phenomenon which are dependent on contagion. Contagion can have effects that are either positive or negative. The success of females searching for territorial males is positively affected by contagion. The negative consequences associated with disease or the spread of fire are also dependent on contagion. Fragmentation is not, therefore, negative per-se. Its consequences, good or bad, are solely dependent on the extent to which it affects various contagion-related phenomena. Contagion phenomena will always be scale dependent - and these dependencies will be rooted in the biological and physical properties of the phenomenon. Fire, for instance, can be effectively stopped by a rather narrow fire break. This fire break may have absolutely no impact on the dispersal efficiency of a large raptor, but may represent an absolute barrier to a salamander. Similarly, a disease that depends on direct transmittal could easily be controlled by producing a fragmentation pattern that separated the members of the species in question. If, however, the disease were vectored through a prey item, then fragmenting the system would only be an effective method of disease control if it reduced the encounter rate between the predator and its infected prey.

When modeling spatial phenomenon, it is necessary to choose an explicit spatial scale at which to model. Smaller scales will need to be implicitly modeled through indices - and these indices may, themselves be scale dependent. In this model, each home-range-sized polygon is given a quality index, and this index is in turn linked to fitness values. For modeling the spotted owl, the explicit scaling is very large (1000 ha) - based on the average size of individual owl home ranges. The fragmentation of vegetation on the landscape, however, is on the order the size of timber sale units (about 10 ha). If, for example, the quality index for a home range were based on the acreage of suitable habitat within the home range, all spatial patterning below the size of the home range would be ignored by the mode 1. Any home range with 50% owl habitat will be modeled as being of equivalent quality (equal values for mortality, aversion, etc.) regardless of the pattern of the remaining habitat within the home range. If spatial patterns within the home range are thought to be important, then they must be incorporated into the home range quality index through the use of spatial statistics such as average patch size or fractal dimension. Because fragmentation is only explicitly modeled at the broadest scale, fragmentation at lower scales may have impacts both positive and negative that are not represented by model behavior.

Territories as islands

Territories can be thought of as small islands, each having a maximum of one reproducing pair. Like islands, they have spatial dimension - they occupy a certain area of the map. And, like islands, when they experience local extinction (in this case one or both members of the pair either dies or emigrates), they must be recolonized through immigration from owls outside the territory or by an existing,, non-territorial Ifloaterl population within the territory.

The concept of territories as individual islands is key to the dynamics of clusters in the model. Larger reserves can be thought of as an archipelago in which all of the islands are very close to one another. Fragmenting the landscape has the effect of moving the islands further apart.

The loss of a reproducing pair is, in effect, a local extinction. The rate of recolonization of an individual territory will be dependent on the spatial arrangement of the habitats and the fecundity of the reproducing pairs; that is, how many individuals are looking for territories or mates and the likelihood they will find the site in question.

Typical yearly adult survival for spotted owl adults ranges between 0.81-0.92 (Thomas et al. 1990: 230-231). The pair survival rate (both members survive) will therefore range from 0.72 to 0.84. When the probability of search by dispersing juveniles falls below the pair survival rate, juvenile dispersal mechanisms will not be sufficient to maintain the population of pairs at their habitatbased carrying capacity. The system will become dependent on recolonization by non-territorial adult Ifloaters, that are already on-site. As pairs are lost due to local extinction, this will increase the distance between reproductive pairs, further increasing the disparity between extinction and colonization rates. In the absence of a balance between the rates of pair loss and reestablishment, the population will unavoidably tumble towards extinction.

The role of clusters

From a modeling standpoint, a system of clusters is more stable than a diffuse system because the clusters produce regions where search efficiency is maximized. In a cluster of suitable territories, a population can recover from low levels because P(p) will remain high. That is, because all of the remaining members of the population remain close, the impacts on P(p) are minimized and the model behaves like a traditional population model, exhibiting positive growth rates when occupancy is reduced. Dispersing males have a high probability of finding habitats immediately adjacent to existing pairs. Dispersing females will more easily find the territorial males because of their adjacency. The key to successful clusters is clearly to make the clusters large enough to avoid high levels of extinction at the cluster level. In practice this means that each cluster's carrying capacity should be large enough that normal population declines driven by environmental and demographic stochasticity do not drive the population down to levels at which random extinction is likely. Looking only at demographic stochasticity, this would suggest a minimum cluster population size of approximately 20 breeding pairs (Richter-Dyn and Goel 1972).

The effect of shape

The negative impacts caused by cluster irregularity are also due to habitat search. A circular cluster of suitable habitat minimizes the distance between clusters. All other geometric forms will have reduced P(p) when compared with the a circular cluster. The impact of cluster irregularity are, in fact, probably more pronounced than is indicated by figures 8-10. In these simulations, the risks associated with crossing poor quality habitat were identical to those encountered in suitable habitat. If greater risks were encountered in the poor habitat, the effects of irregular,cluster shape of would be accentuated.

Source-sink dynamics

The increase in variance that is observed in systems containing marginal habitat for nesting (Fig. 12) is due primarily to the increased variance in adult survival rates. If nesting is restricted to the clusters, the population will equilibrate with a relatively constant proportion of the adult population within the clusters and dispersing through the matrix. Changes in the population vital rates will, therefore, be bounded by the levels of environmental and demographic stochasticity, and population variability will remain reasonably constant over time.

When breeding occurs exterior to the clusters, the population becomes more dynamic. Both the vital rates and the spatial configuration of the population will be dependent on the proportion of the population that exists exterior to the reserve structure. If a large number of the breeding pairs lie exterior to the reserve, not only will the overall survival rates decline, but the system will also become diffuse, lowering P(p). The bounds on the population growth rates will therefore be set by both the proportion of the breeding population found exterior to the reserve and the levels of environmental and demographic stochasticity. Because the model runs are begun with all of the birds within the reserve structure, variability increases over time (Fig. 12).

The decline in mean occupancy levels in the source-sink system is due to decreased interaction between clusters. Dispersing juveniles that settle exterior to the reserve would, if this option were not available, continue searching and some of them would become pairs within the clusters. This outcome suggests that a reserve design may be more stable if the boundaries between the reserve and the surrounding landscape are very distinct. Maintenance of sink areas exterior to the reserve system may lead to sub-optimal choices on the part of dispersing juveniles.

Summary

A model containing explicit links to landscape vegetation patterns was created. Its results are consistent with previous models based on search efficiency (Lande 1987, 1988, Doak 1989, Thomas et al. 1990). An analysis of the model structure demonstrates that this model form will favor clumped reserve structures over diffuse structures due to the inherent geometric properties of the search function. The model results and subsequent analysis indicate that land management policies that increase fragmentation are extremely detrimental to territorial populations because the uncertainties of successful search cause the population dynamics in reduced populations to experience reduced rates of territory recolonization. Low population levels in fragmented systems will not, therefore, exhibit the strong upward population pressure inherent in traditional density-dependent models. Recovery will be slow and difficult and, at a specific level of fragmentation, impossible.

Negative impacts associated with fragmentation can be mitigated by clustering reserves. Clusters will display greater search efficiencies and will be more stable than a random diffuse system with equal acreage in suitable habitat.

In addition to supporting these general conclusions, this model extends the capabilities of previous models through its ability to directly model the irregular and patchy habitat configurations found in real landscapes. It also allows f or a gradient of habitat quality and ties risk and movement rules directly to that gradient. These properties allow owl demographics to be based directly on map information held in GIS systems, and allows the modeling of populations in spatially dynamic landscapes.

Model Implementation: The BLM in Oregon

Parameterizing the Model:

All of the landscapes used up to this point have been hypothetical. In order to link the model to actual landscapes, links must be made between the configuration of the landscape and its quality as owl habitat. Because the this linkage is performed through the use of a GIS database, the landscape attributes must be chosen from those available within the GIS. In order to facilitate this process, Jon Bart, chairman of the Northern Spotted owl Recovery Team, looked to the available data to determine those habitat attributes that were linked to specific demographic information. The attribute that best correlated with survival, fecundity, and nest density of owls was the amount of mature forest within a region of the map surrounding the owl nest-site. For modeling purposes we translated this into the proportion of mature forest within a home-range-sized area, a hexagonal area 1000 ha in size.

Dr. Bart drew together the available data and constructed functions for survival and fecundity and the probability of nesting based on the amount of mature forest in a home-range-sized area. These relationships were discussed at a series of meetings with a group of biologists employed by the Forest Service, Bureau of Land Management, and private industry.

our purpose was to utilize these parameters, in conjunction with projected management plans, to look at future forest conditions and to evaluate the efficacy of those plans in terms of the maintenance of owl populations. our primary purpose was comparative: we wished to evaluate and ordinally rank the management plans, not to attempt to predict the number of owls within the landscape in 100 years. There are enormous uncertainties concerning the reliability of the habitat relationships, the recovery time f or stands that are cut, and patterns of land utilization on those lands not controlled by the *BIM*. The model results should therefore be interpreted conditionally: given that the tree growth rates, habitat relationships and owl behavior patterns occur exactly as specif ied, the plans produce the following number of owls in the following locations 100 years into the future.

Because of these uncertainties, we ran the model for each management alternative using 3 sets of parameters. Each was based on Dr. Bart's original parameters (Table 5, Fig. 18), but the parameters were shifted: In the second set, the parameters associated with >60% mature forest also were true for cells with 40-60%. In the third set, these parameters were true for stands having >30% suitable habitat. All other parameters were similarly shifted (Fig. 19). This shifting, in effect, changed the evaluation of the landscape, but did not change the behavior of the owls within habitat of a specific quality. Viewing the landscape as a system of sources and sinks, in Dr. Bart's rule set only homerange areas with > 60% mature forest are considered sources. In the second rule set Home range areas with >40% mature forest are sources, and in the third set home-range areas with >30% mature forest are sources. Dr. Bart's original rule set will therefore produce the lowest number of owls. The other two model runs are less pessimistic.

Acknowledgements

This modeling was supported by the USDA Forest Service, Redwood Sciences Laboratory, Arcata, California and was carried out as part of a post-doctoral appointment. Special thanks are given to Roland Lamberson, Humboldt State University, for many hours of consultation concerning model construction, Curtis Voss, Redwood Sciences Laboratory, for coding the unit controlling map appearance (CLASS.EXE) and Barry Noon, Redwood Sciences Laboratory, who has been the driving force behind both this modeling and previous models presented in Thomas et al. (1990). Without the help and support of these individuals, and many others as **well,** this **work** could not have occurred.

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Appendix

1. Moments. The first, second and third moments for a uniform random distribution should be 1/2, 1/3, and 1/4 respectively. Typical output for n = 1,000,000 are 0.5002, 0.3335, 0.2501 respectively.

2. Uniformity. In this test random numbers are generated and cast into a series of bins, based on their value. This test was run with 100 bins and a Chi-Square test was performed against the assumption that all bins would be equal in value. Typical values for n = 1,000,000 are < 1.0; The 0.05 critical value is approximately 120.

3. Pairs. This test looks at first order sequential correlation. Sequential pairs of random numbers are produced and binned based on their value. Ideally, all pairs should be produced with equal frequency. In this case the pairs were binned into a 10xIO matrix. A ChiSquare test was performed against the assumption that all matrix elements are equal in value. Typical values for n = 1,000,000 were < 2.0. Again, the 0.05 critical value is approximately 120.

4. Runs. This test looks at the overall degree of sequential correlation between random numbers generated. In this test, random numbers between 0 and 1 are generated and are rounded to 0 or 1 based on their value. As these numbers are produced they are grouped into 'runs'. 00010, for instance would have a run of 3 and two runs of 1. The run lengths are collected and, after a large number of random numbers has been produced the question is asked: is the population of runs generated significantly different than would be expected based on the binomial distribution. Here again, a ChiSquare test of fit was used to test for runs <= 30 elements in length. Typical values for n = 1, 000, 000 ranged from 15-20. The 0.05 critical value is 41.3.

5. Period. All random number generators produce pseudorandom numbers in a deterministic cycle of finite length. The period of a random number generator refers to the length of the cycle. To test for the period, the random number generator is 'seeded' with a value and then is looped to produce random deviates until the 'seed' value is reproduced. The maximum period for a generator is, therefore, determined by the number of bits set aside to hold the seed, but may be less if the generator is improperly constructed. For the generator used in the model, the number of bits = 32, and the observed period is 2 32 = 4.3 billion. other tests can be run, but based on these results, there is no reason to assume that any non-random characteristics of the random number generator will **have** a significant effect on the model performance.

Table 1. A summary of factors that can affect an individual's movement in the model.

Factor	Based on	Sex	Form
Become Territorial	Habitat Quality/Occupancy	M	Probabilistic Switch
Aversion	Habitat Quality	M/F	Weighting
Site Fidelity	Habitat Quality	M/F	Weighting
Linear Propensity	Behavior	M/F	Weighting
Territorial Aversion	Occupancy	M	Weighting
Female Finds Male (Current Cell)	Occupancy	F	Absolute Switch
Female Finds Male (Adjacent Cell)	Occupancy	F	Probabilistic Switch
Global Boundary	—	M/F	—

Table 2. An example of the process used to determine movement in a heterogeneous landscape. If 0.448 were generated randomly, then direction 4 would be chosen. Direction 3 is never chosen.

Direction	The initial vector	Weighing factor	Scaled vector	Cumulative Probability
1	0.143	0.900	0.143	0.143
2	0.143	0.600	0.095	0.238
3	0.143	0.000	0.000	0.238
4	0.143	1.000	0.159	0.397
5	0.143	1.000	0.159	0.556
6	0.143	1.900	0.302	0.857
7	0.143	0.900	0.129	1.000

Table 3. List of the parameter values used for the simulations. Parameters were chosen to produce as optimistic an estimate of owl survival as could be supported by these data. Parameters only varied with site quality where explicitly stated.

Parameter	Value	Source
Juvenile survival	0.29	Franklin et al. 1990
Sub-adult survival	0.935	Thomas et al. iggo
Adult Survival	0.935	Thomas et al. 1990
Birth rate	0.335	Franklin et al. 1990
Aversion	1.0, 0.5[1]	
Boundary	Wrap-around	
Linear propensity	2.0	
Site fidelity	0.5	
Territorial aversion	0.5	
Female finds male	0.5	
Time-steps	40	
Runs	30	

[1] Only two habitat types were placed in the map, one representing the best habitat and the other representing the worst. This split corresponds to suitable/unsuitable designations found in past models.

Table 4. List of the parameter values used for the cells exterior to the habitat reserve (Fig. 11, 12) . Parameters within the reserve, as well as general parameters that pertain to all cells are presented in Table 3. Parameters are those calculated for measured a demographic study, Roseburg, Oregon.

Parameter	Value	Source
Juvenile survival	0.219	Thomas et al. 1990
Sub-adult survival	0.588	Thomas et al. 1990
Adult Survival	0.812	Thomas et al. 1990
Birth rate	0.310	Thomas et al. 1990

Table 5. Rule set used for simulation of BLM management alternatives. Values for sub-adult and adult survival, and probabilities of pair formation are based on values derived by Dr. John Bart.

	Land Classification (percent)				
	<20	20-30	30-40	40-60	>60
Survival					
Juvenile	0.20	0.29	0.29	0.29	0.29
Sub-adult	0.38	0.38	0.41	0.45	0.50
Adult	0.75	0.76	0.82	9.90	9.96
Fecundity					
Adult	0.00	0.34	0.34	0.34	0.34
Movement					
Nesting prob.	0.13	0.40	0.55	0.83	1.00
Aversion	0.30	0.50	0.70	0.90	1.00
λ					
Non-breeding	0.75	0.76	0.82	0.90	0.96
Breeding	0.75	0.80	0.87	0.94	1.01

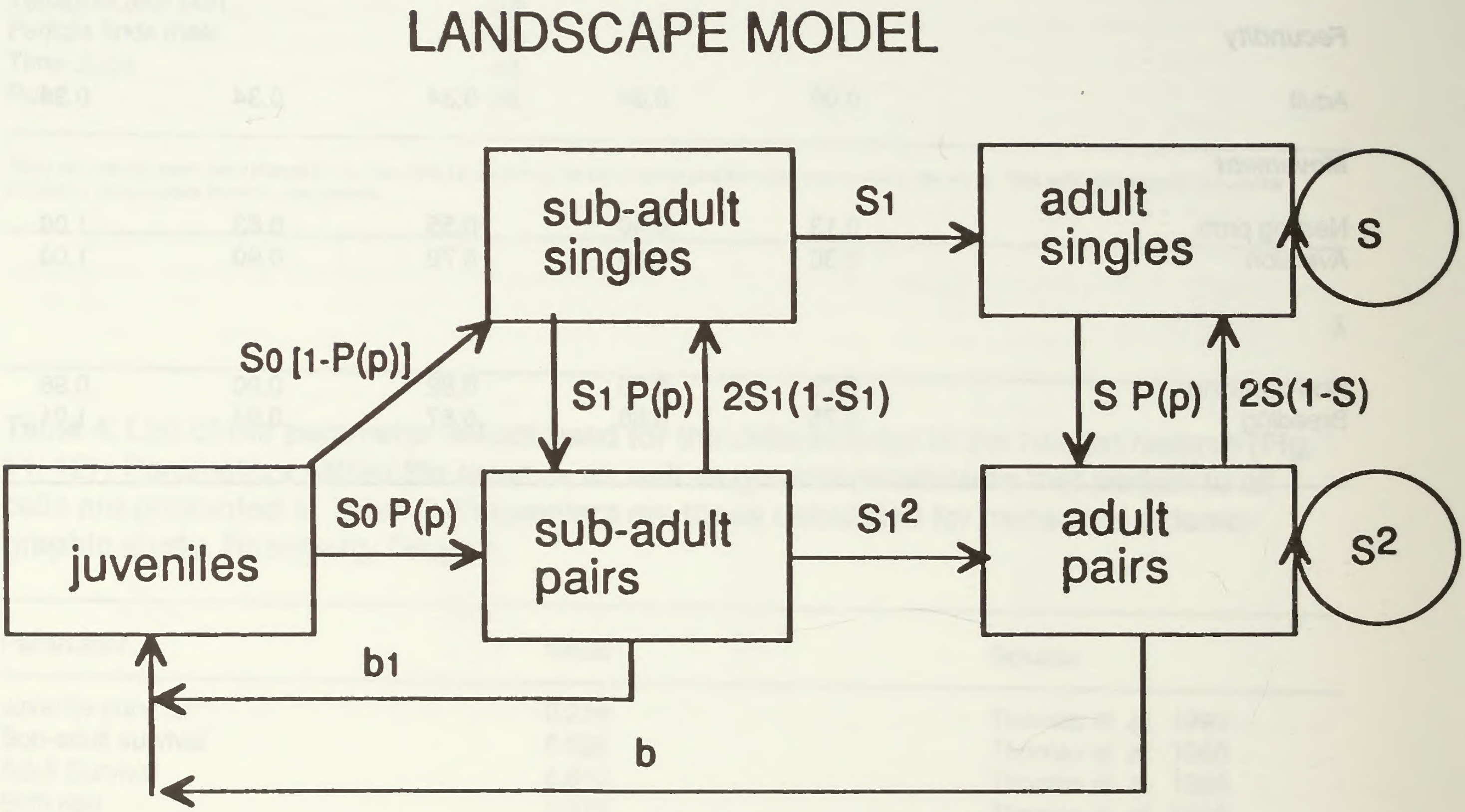

Figure 1. *Flow diagram of the life history structure used in the landscape model. P(p) is the probability of pairing.*

MALE MOVEMENT

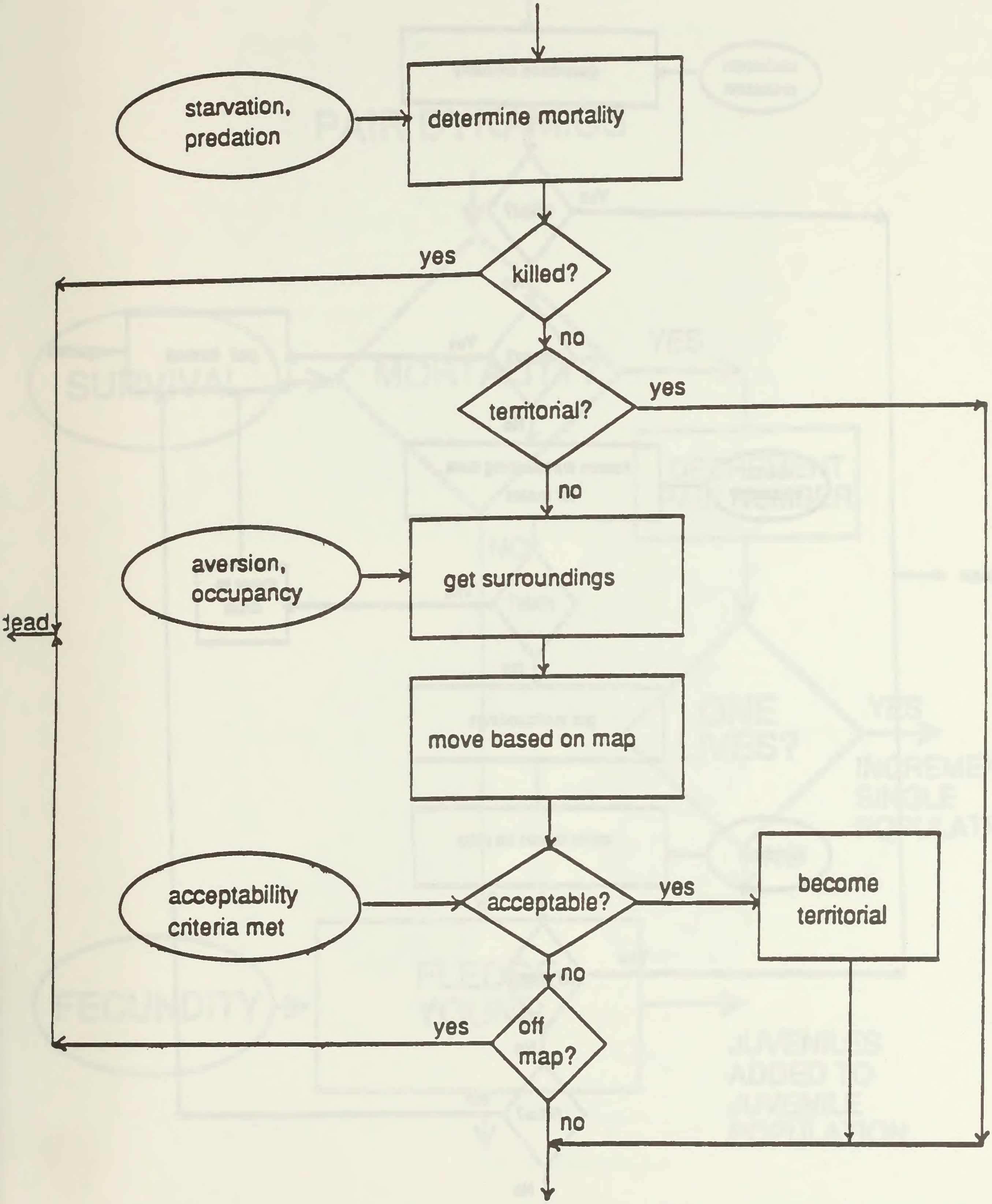

Figure 2. *Flow diagram representing the process f or determining male behavior at each time step in the model.*

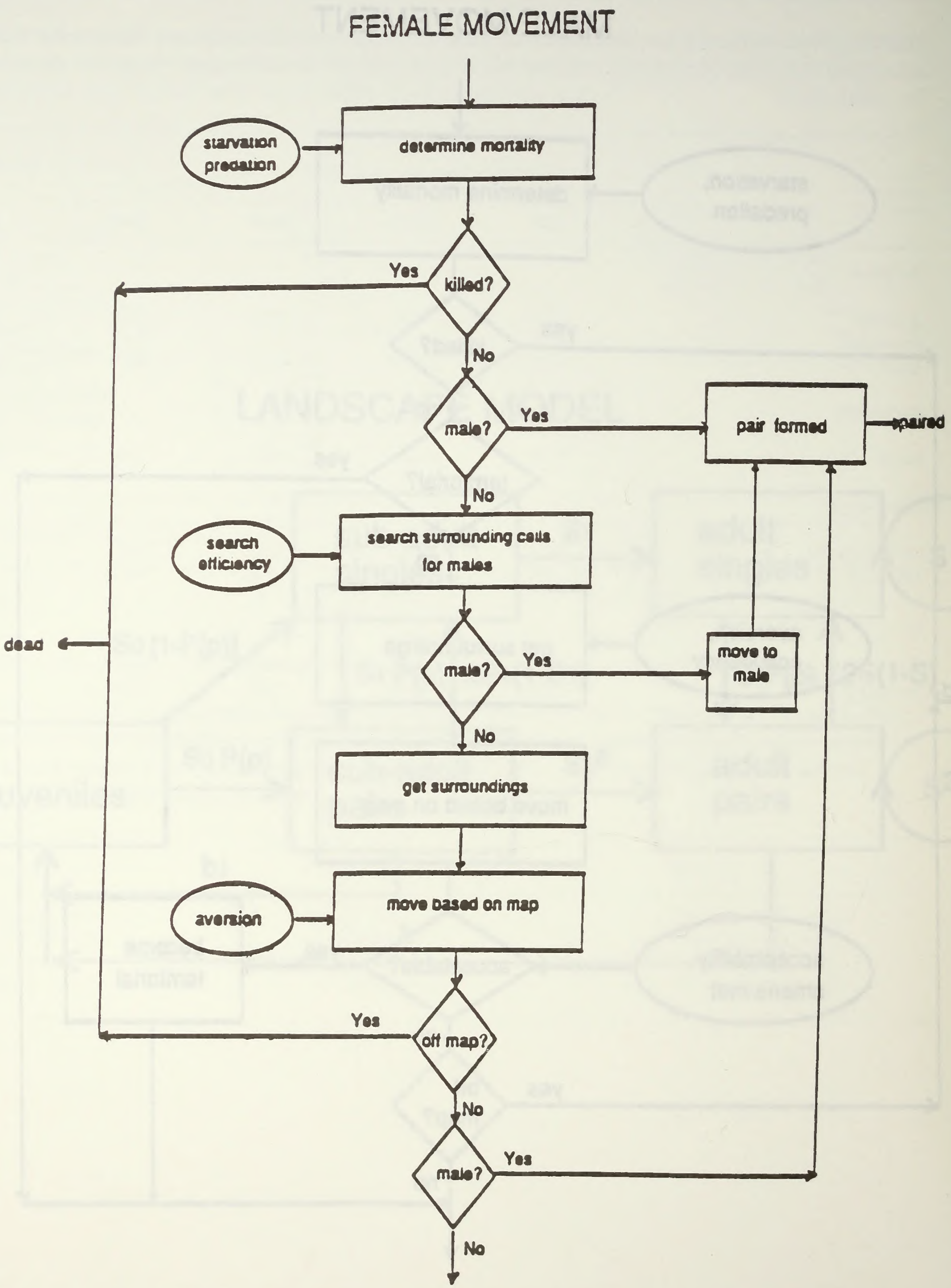

Figure 3. *Flow diagram representing the process f or determining female behavior at each time step in the model.*

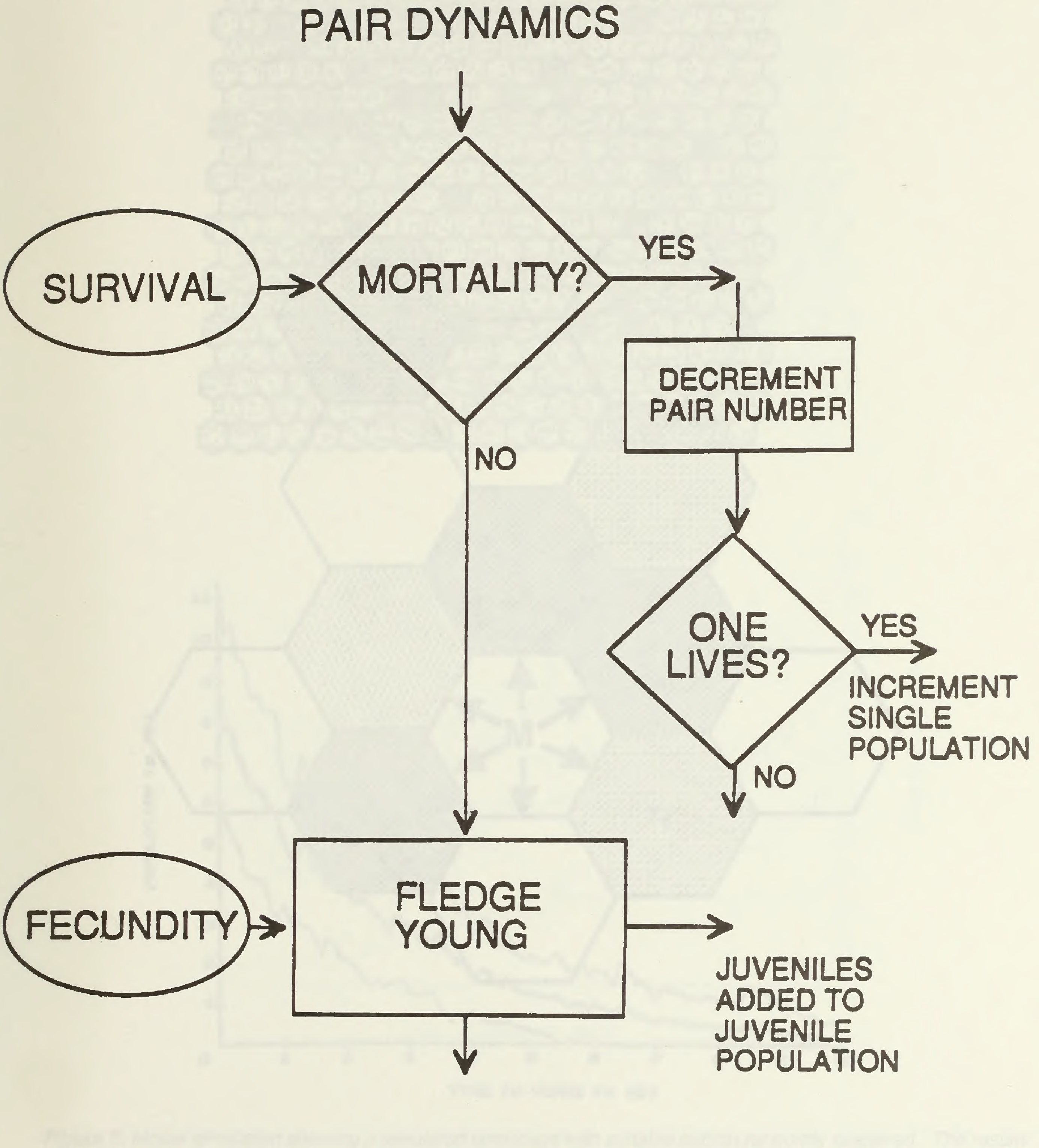

Figure 4. *Flow diagram representing yearly pair dynamics. Pairs only remain reproductive if both members survive.*

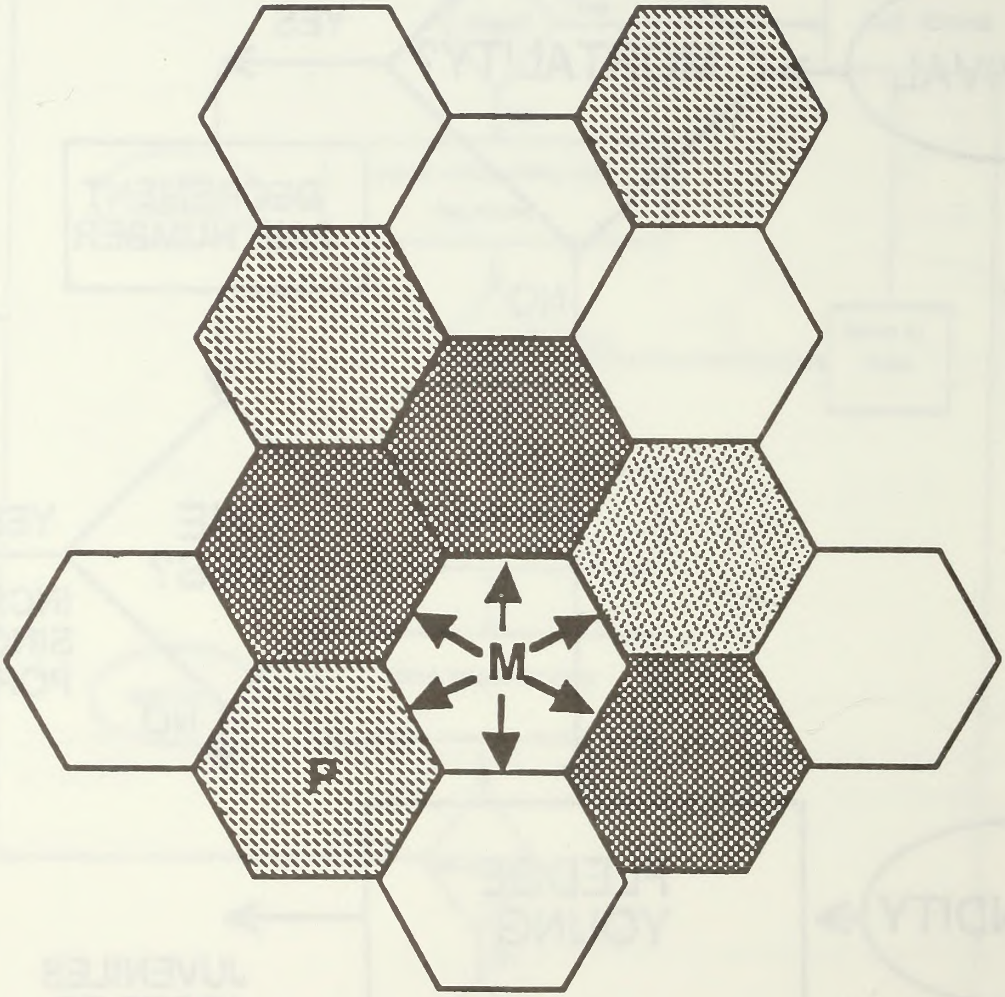

Figure 5. The arrows represent the potential choices for a male in a heterogeneous landscape. The move will be based on a probability vector conditioned by the different qualities of the choices.

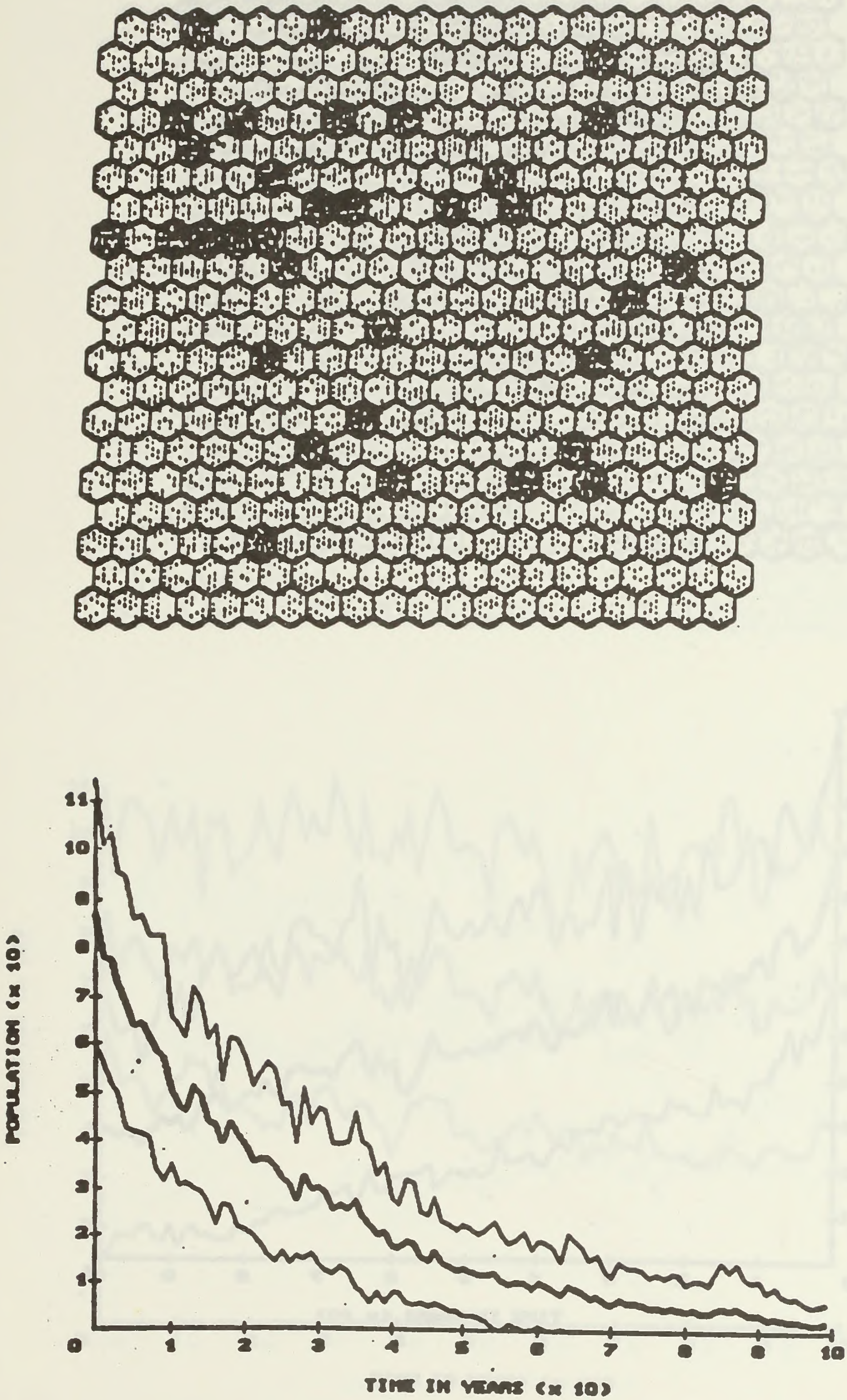

Figure 6. *Model simulation showing a simulated landscape with suitable habitat randomly scattered. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

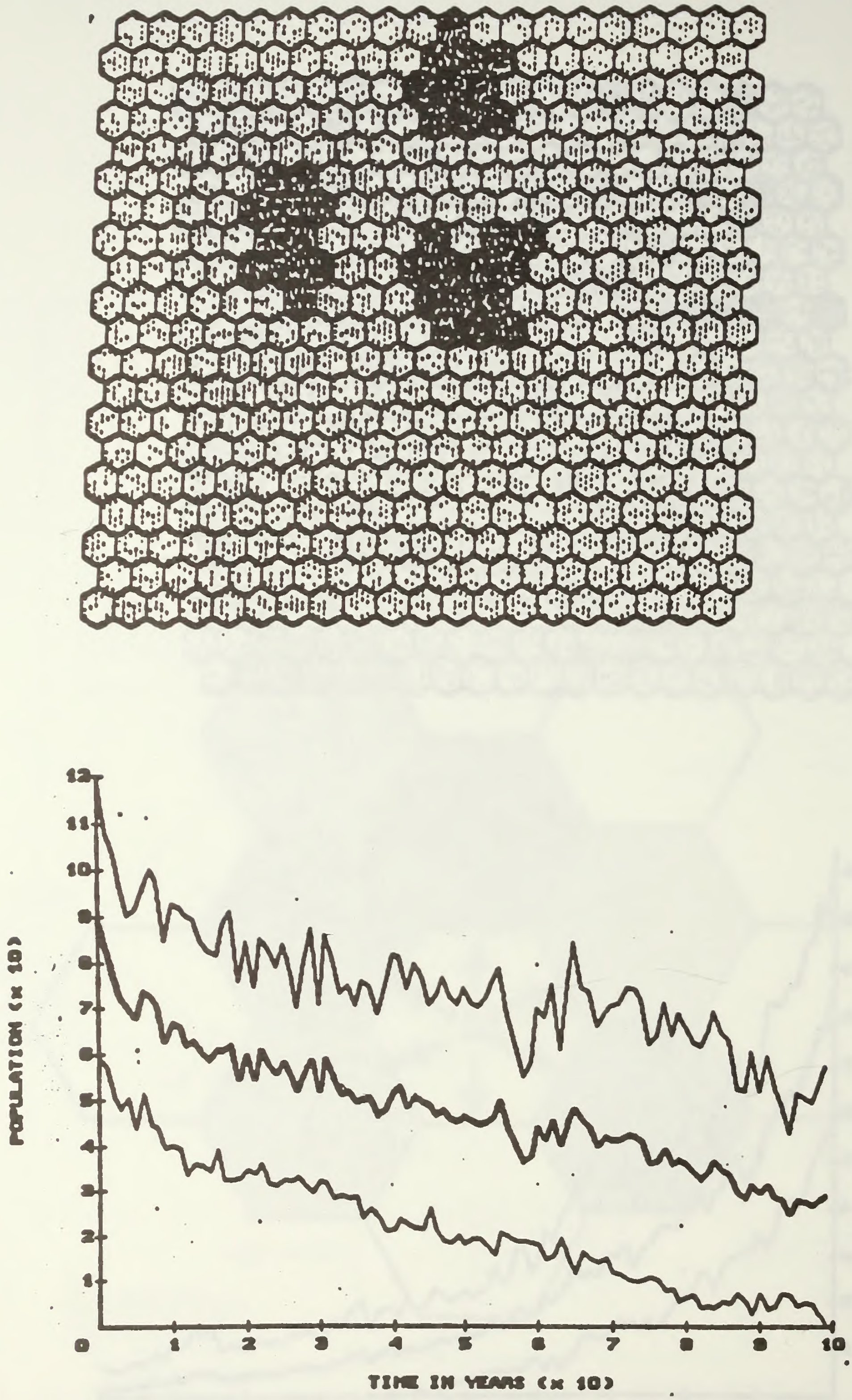

Figure 7. *Model simulation showing a simulated landscape with suitable habitat arrayed in three small blocks. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

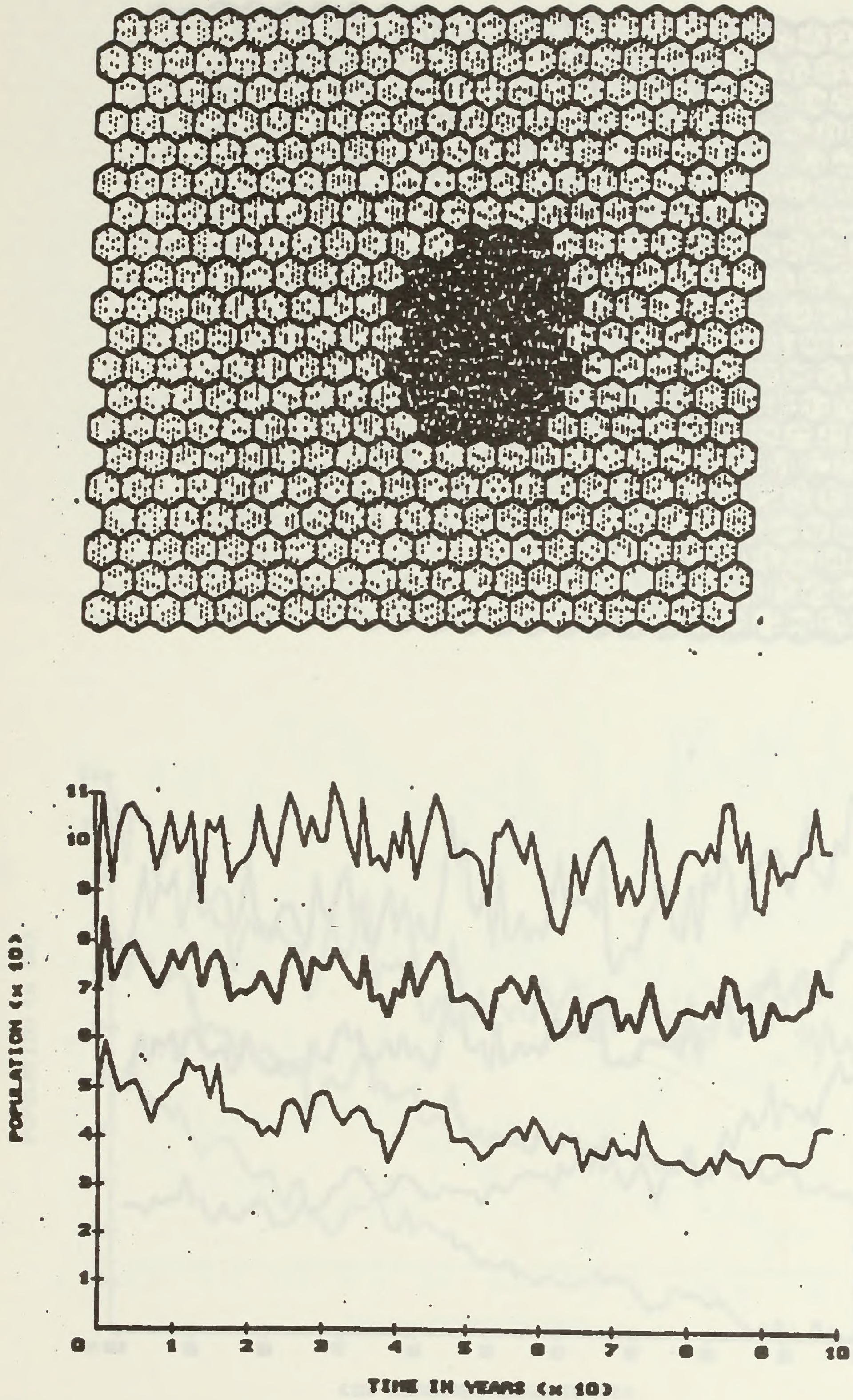

Figure 8. *Model simulation showing a simulated landscape with suitable habitat arrayed in one large regular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

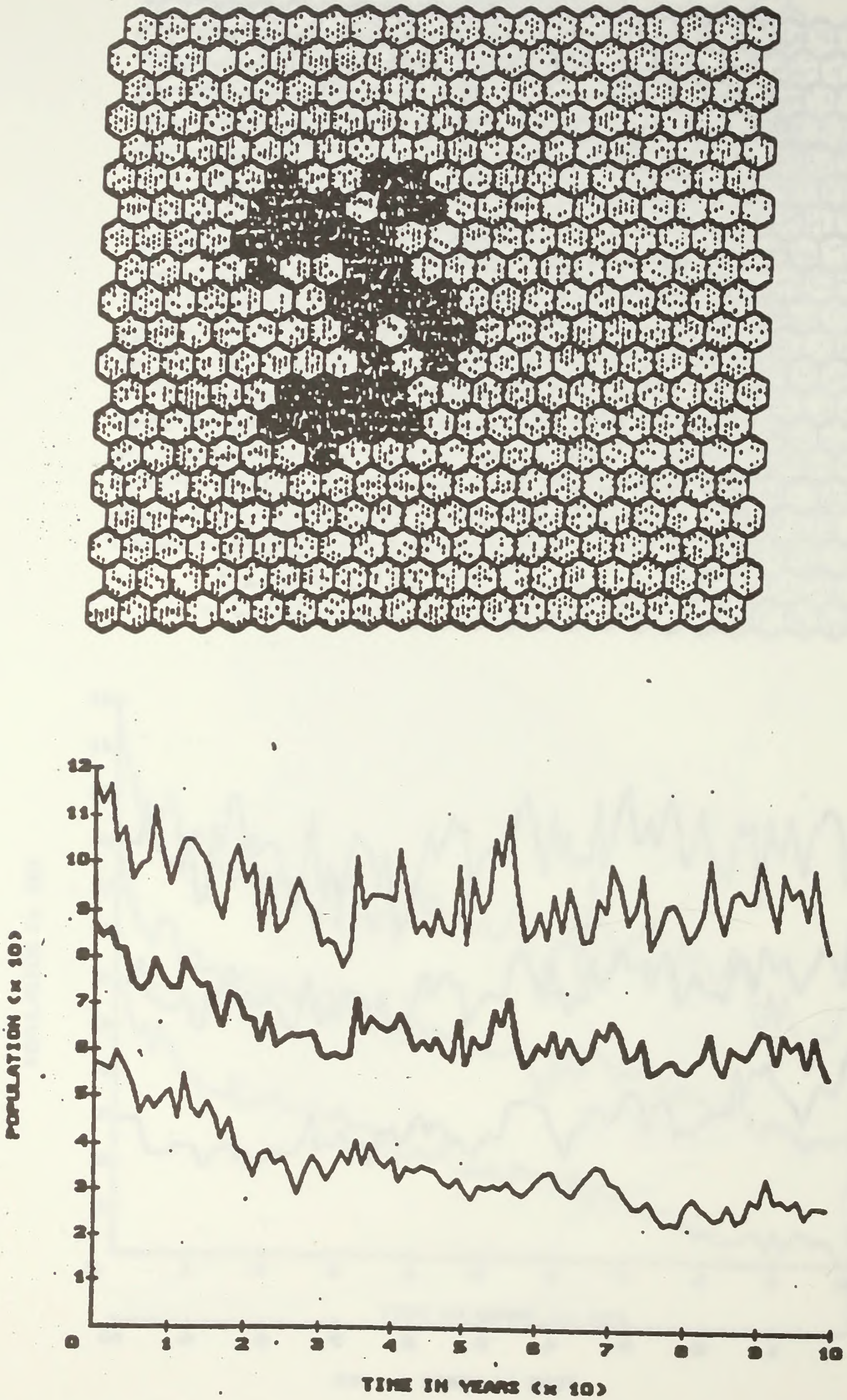

Figure 9. Model simulation showing a simulated landscape with suitable habitat arrayed in one large irregular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

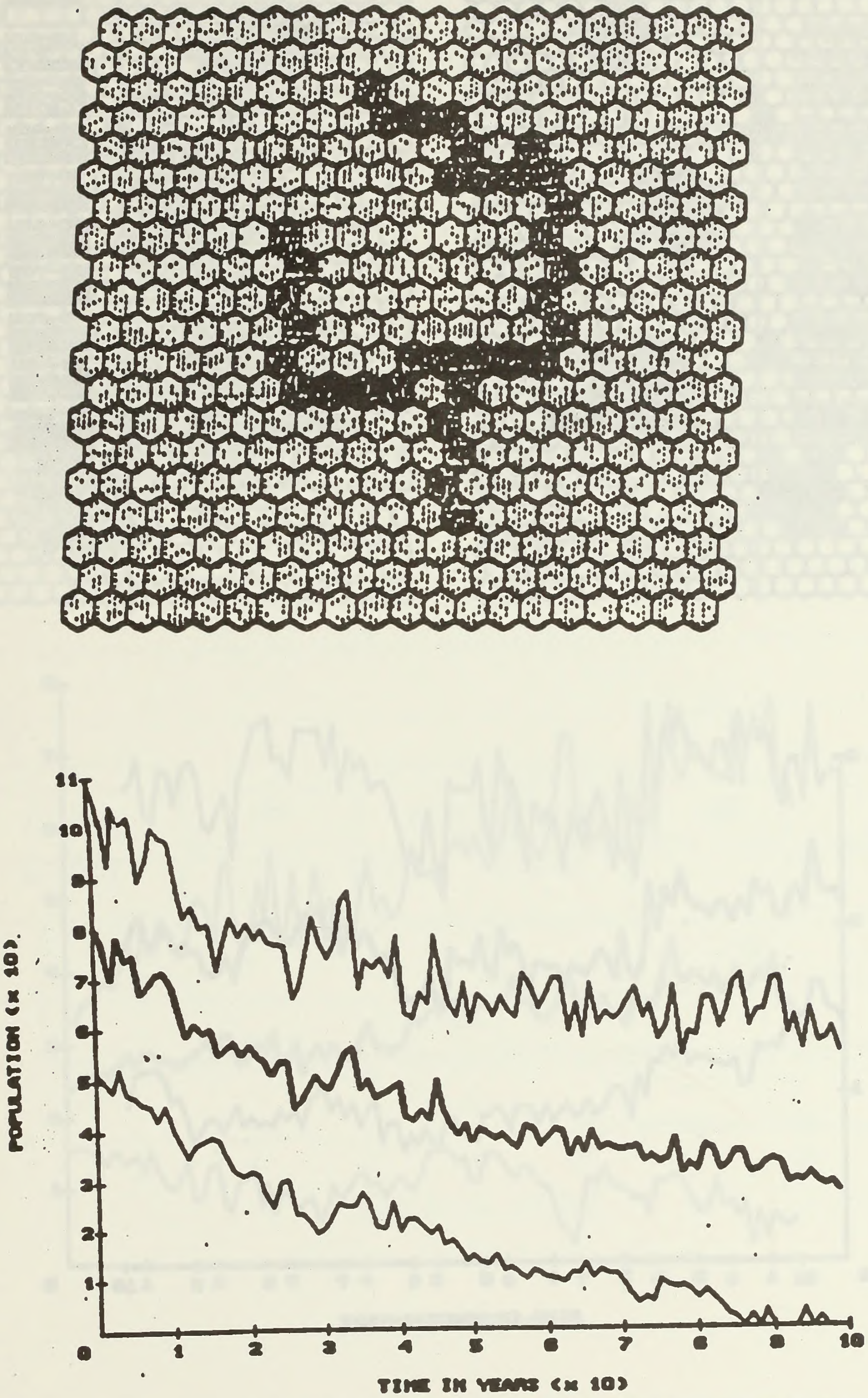

Figure 10. Model simulation showing a simulated landscape with suitable habitat arrayed in one very irregular block. this block is similar in form to reserves that consist of riparian corridors. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

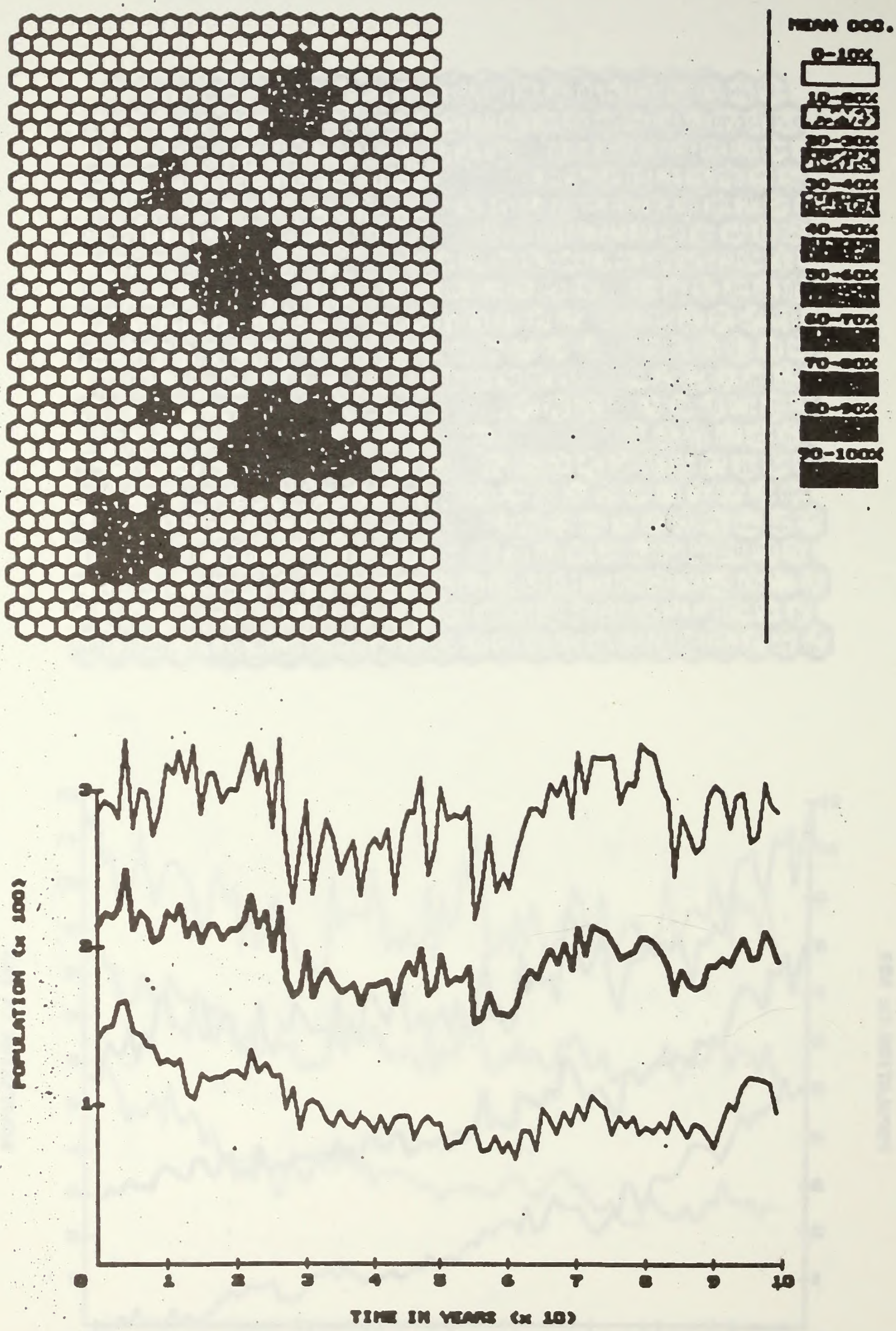

Figure 11. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by unsuitable habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

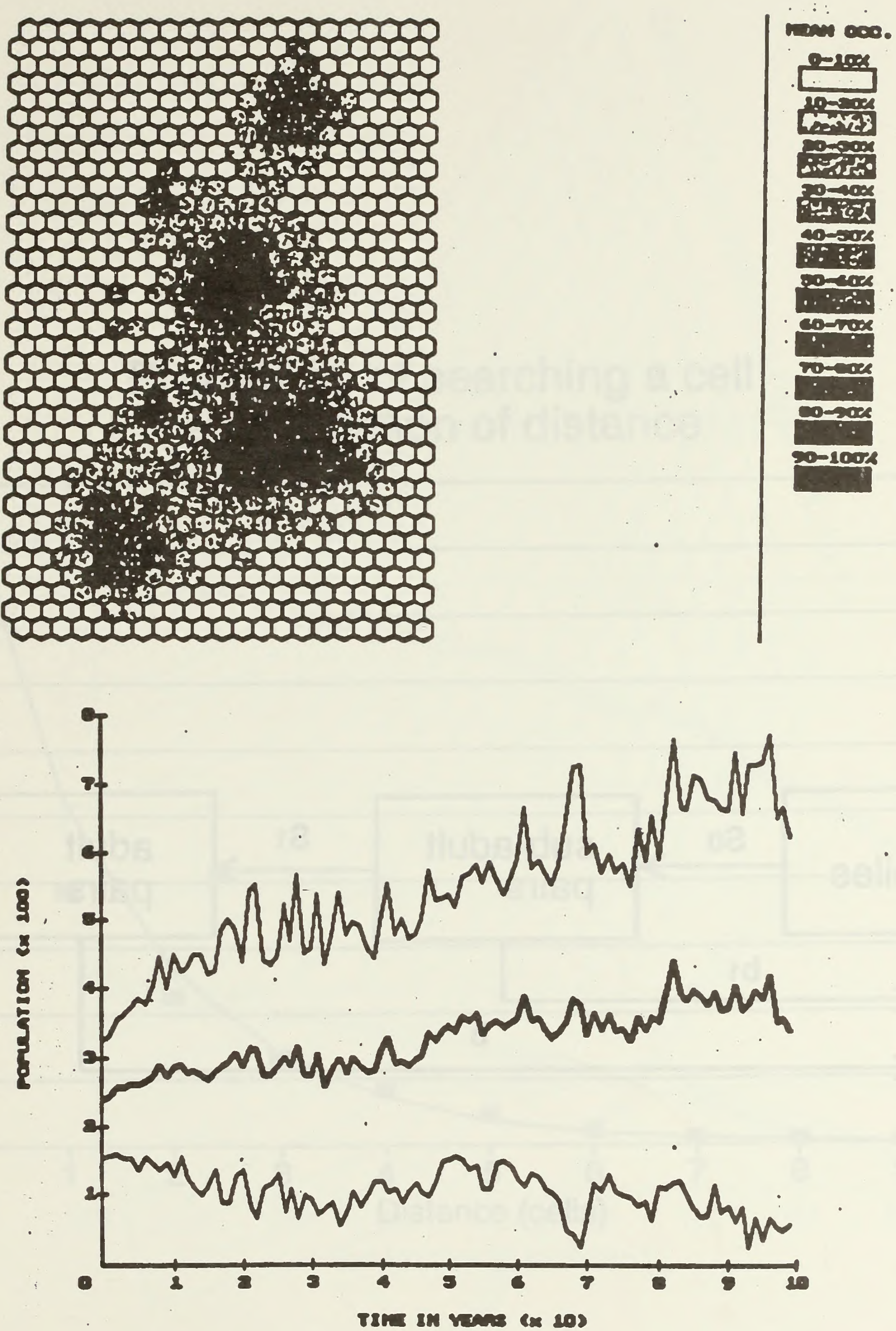

Figure 12. *Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by marginal habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

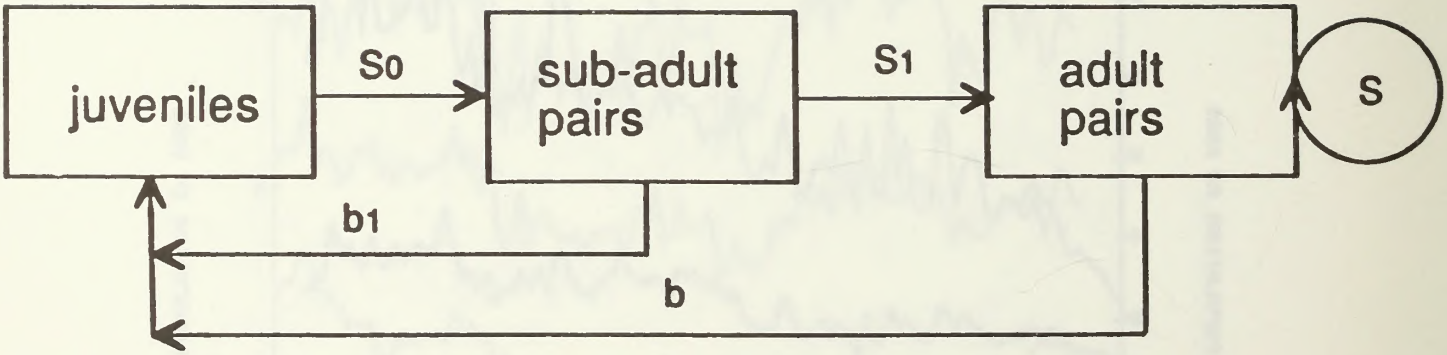

Figure 13. A flow diagram representing the life history structure used in s linear stage-structured matrix model.

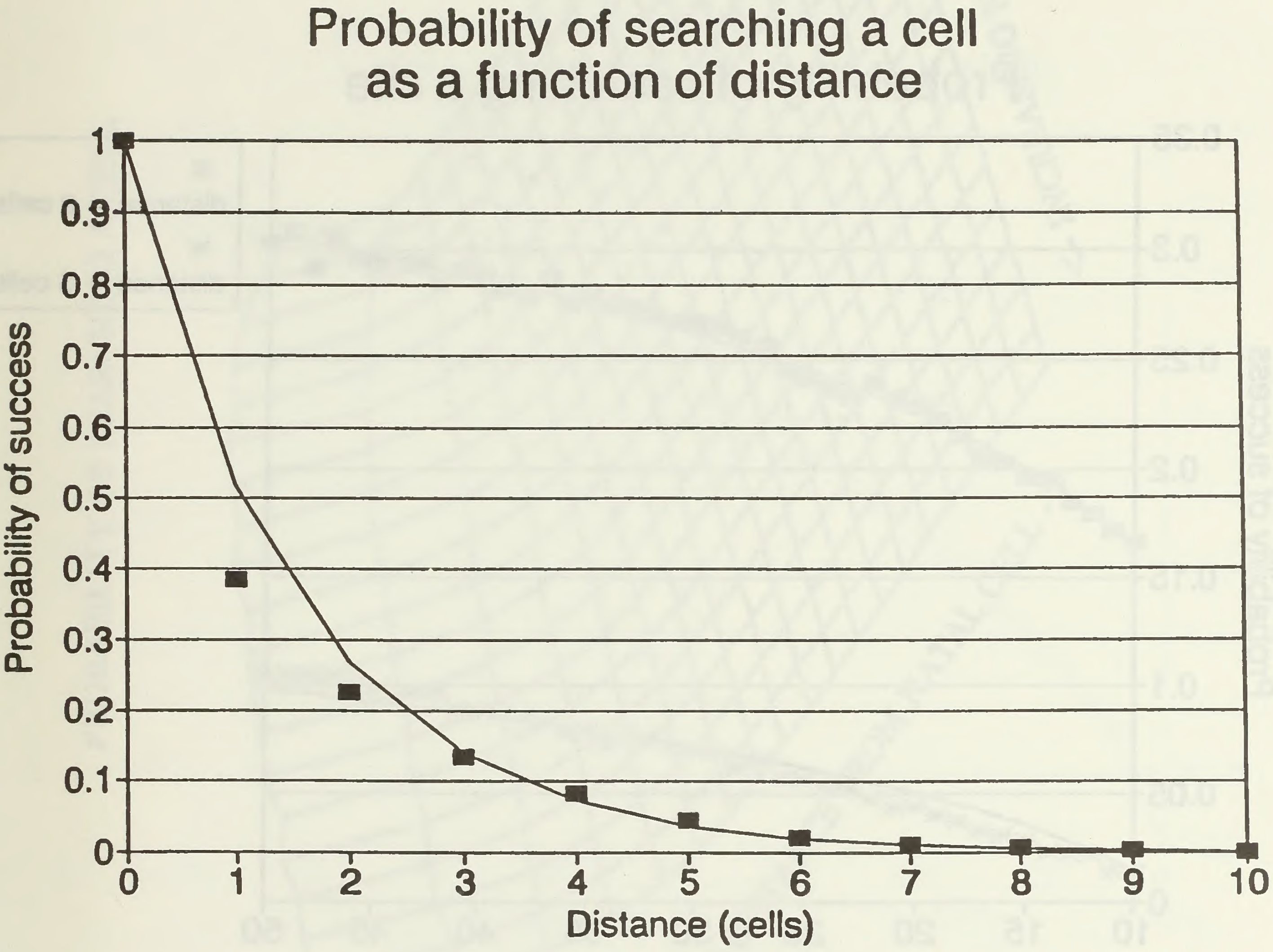

Figure 14. *The probability that an organism searches a cell given 20 searches. The search pattern is a pure random walk. The line is a best-fit exponential function.*

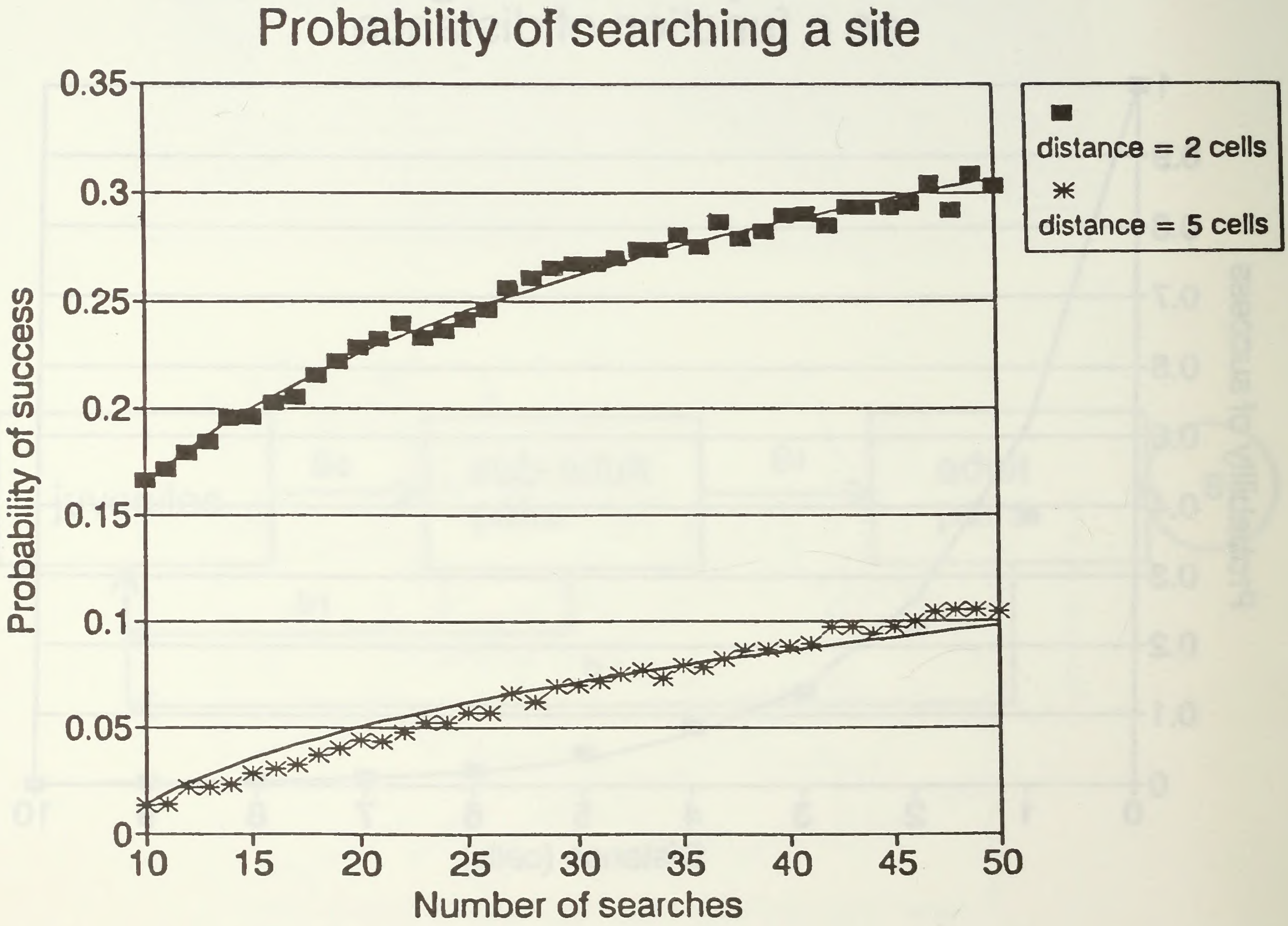

Figure 15. The probability of searching a site, changing the number of searches. The probability of searching a site 2 cells away is greater given 10 searches than the probability of searching a site 5 cells away is given 50 searches.

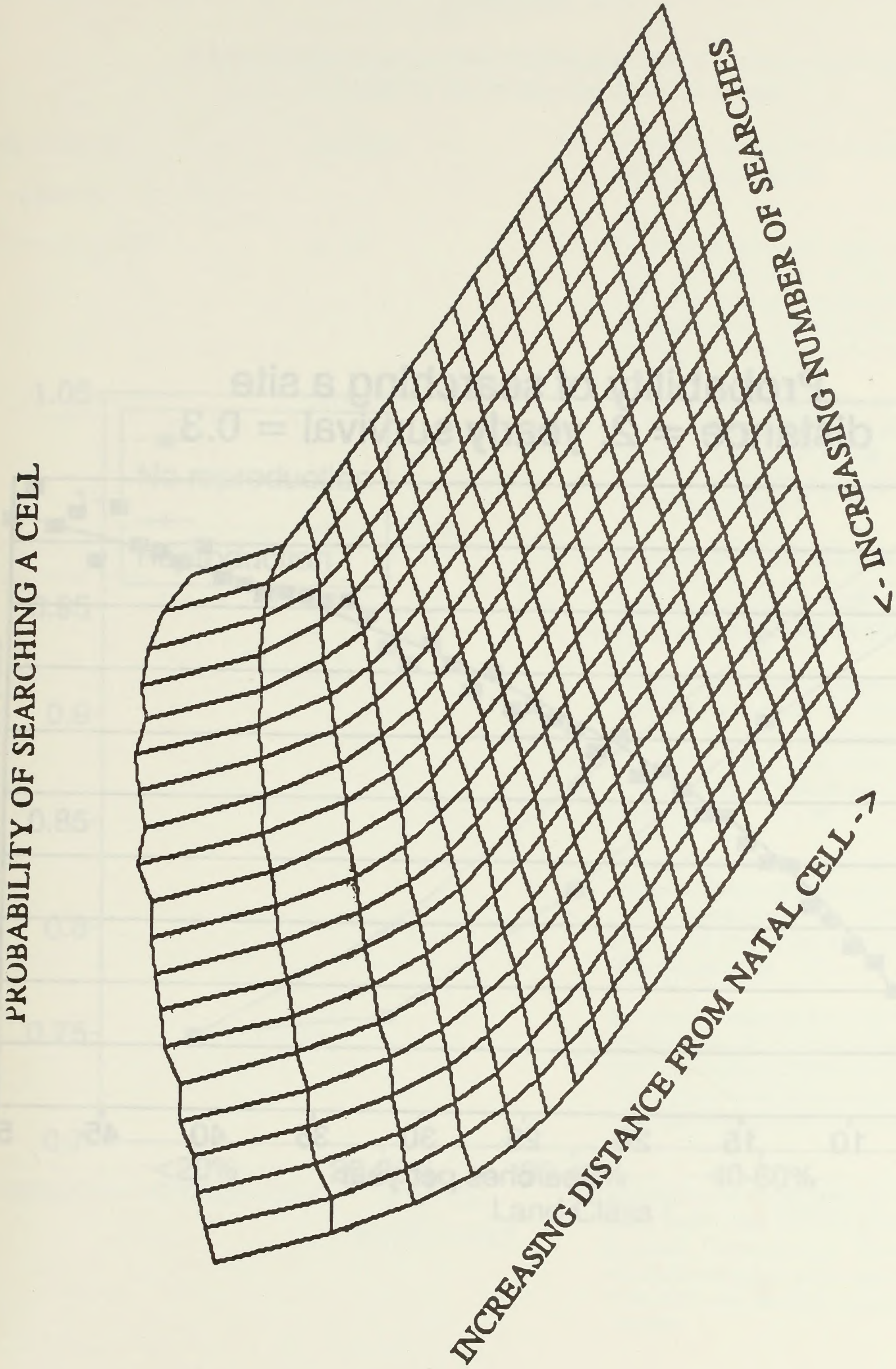

Figure 16. A three-dimensional representation of the probability of searching a cell. Distance from the natal cell dominates the probability function.

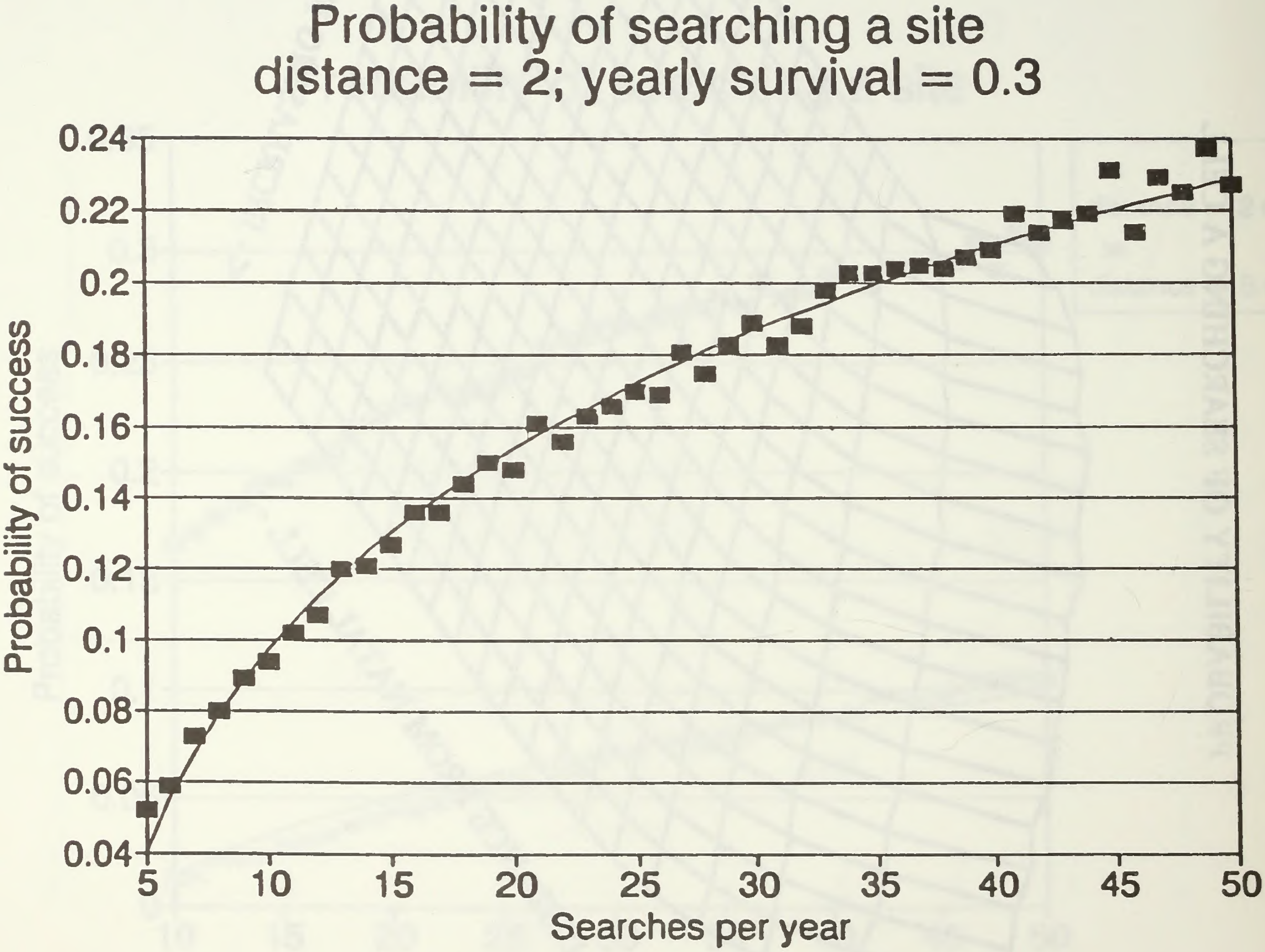

Figure 17. The probability of searching a site with constant mortality. Here, the yearly risk is pro-rated across the number of steps-per-year. The bird searches until the target cell is found or the bird dies.

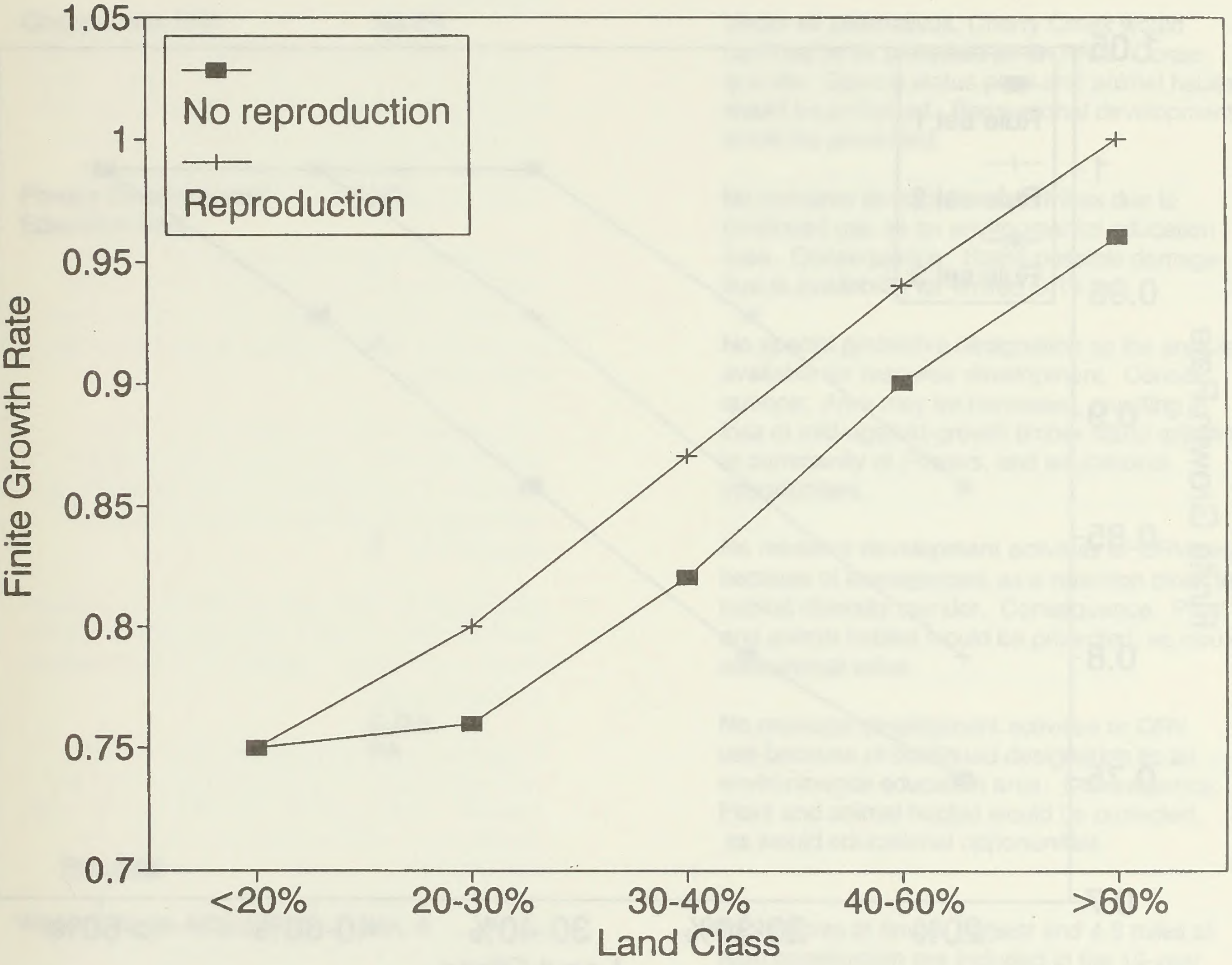

Figure 18. The modeled finite rate of increase (1) associated with a population of spotted owls occupying habitat having varying percentages of mature forest. Values derived from parameters presented in Table 5.

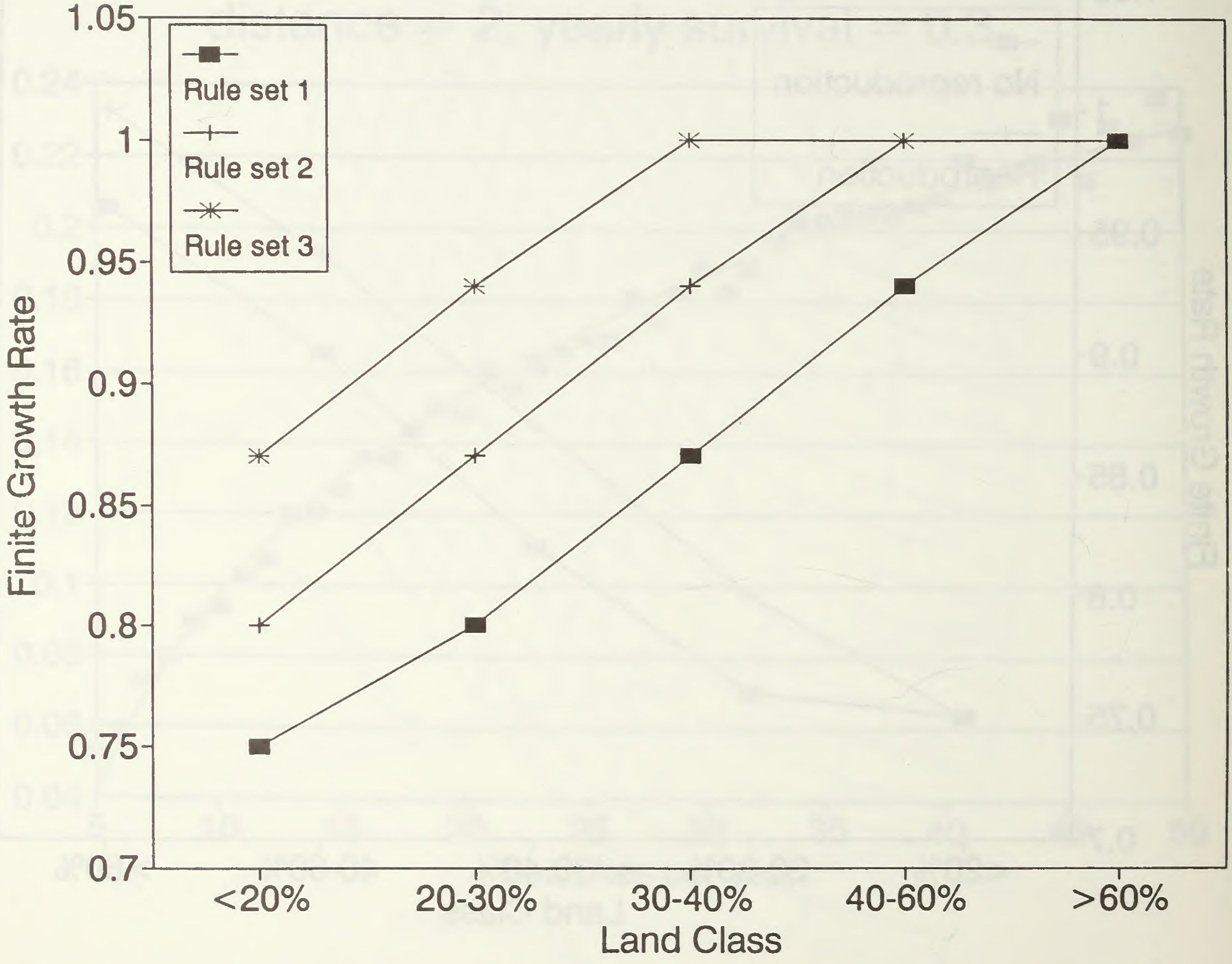

Figure 19. Modeled I associated with habitat quality. Rule set 3 shows the least sensitivity to the quantity of suitable habitat on the landscape.

Appendix IV-J

Probable Management Activities and Major Consequences in Existing and Potential Special Areas

Special Area	Alternative	Probable Management Activities/ Major Consequences
Existing		
New River ACEC	NA-PA	Under all alternatives, New River would continue to be protected as an ACEC, with controls on ORV use, grazing, and spread of exotic species. Consequence: Special status plant and animal habitats, and cultural values would be protected.
Cherry Creek RNA	NA-PA	Under all alternatives, Cherry Creek would continue to be protected as an RNA. Consequence: Special status plant and animal habitat would be protected. Recreational development would be precluded.
Powers Environmental Education Area	NA	No resource development activities due to continued use as an environmental education area. Consequence: Some possible damage due to availability for limited ORV use.
	A	No special protective designation so the area is available for resource development. Consequence: Area may be harvested, resulting in loss of mid-age/old-growth timber stand adjacent to community of Powers, and educational opportunities.
	B	No resource development activities or ORV use because of management as a retention block for habitat diversity corridor. Consequence: Plant and animal habitat would be protected, as would educational value.
	C,D,E, PA	No resource development activities or ORV use because of continued designation as an environmental education area. Consequence: Plant and animal habitat would be protected, as would educational opportunities.
Potential		
Wassen Creek ACEC/RNA	NA, A	1,290 acres of timber harvest and 4.8 miles of road construction are included in the 10-year scenario. Consequence: Disturbance of natural conditions would result in loss of ability to fill five RNA cells, and conduct associated research projects.

Special Area	Alternative	Probable Management Activities/ Major Consequences
	B	890 acres of timber harvest and 4.3 miles of road construction are included in the 10-year scenario. Consequence: While some portions would be managed as retention blocks for the habitat diversity corridor, the overall effect would be the loss of ability to fill five RNA cells, and conduct associated research projects.
	C, D	Area would be designated as an RNA/ACEC. Consequence: Five RNA cells would be filled. Special status plant and animal habitat would be protected. Recreation development would be precluded.
	E, PA	Area would be designated as an ACEC. Consequence: Special status plant and animal habitat would be protected. Ability to conduct research in a totally undisturbed environment would be reduced. Recreational opportunity could be increased by potential trail construction.
North Fork Coquille River ACEC	NA, A	160 acres of timber harvest and 0.3 miles of road construction are included in the 10-year scenario. Consequence: Timber harvest/road construction could affect spawning habitat for coho salmon.
	B, C	140 acres of timber harvest and 0.3 miles of road construction are included in the 10-year scenario. Consequence: Timber harvest/road construction could affect spawning habitat for coho salmon.
	D, E, PA	Area would be designated as an ACEC. Consequence: Special status plant and animal habitat would be protected. Opportunity for recreational trail construction.
China Wall ACEC	NA, A	100 acres of timber harvest and 0.3 miles of road construction are included in the 10-year scenario. Consequence: Possible loss of some special status plant and animal habitat, and cultural values.
	B, C	Part of area in intensive harvest base, although no harvest planned for next decade. The non-commercial forested portion would be designated as an ACEC. Consequence: Special status plant and animal habitat, cultural and historic values would be protected. Some possible future loss of special status plant and animal habitat and cultural values.

Special Area	Alternative	Probable Management Activities/ Major Consequences
	D, E, PA	Area would be designated as an ACEC. Consequence: Special status plant and animal habitat would be protected. Cultural and historic values protected.
Tioga Creek ACEC	NA, A, B, C	20 acres of timber harvest included in the 10-year scenario. Consequence: Some possible damage to old-growth dominated riparian zone.
	D, E, PA	Area would be designated as an ACEC. Consequence: Plant and animal habitat would be protected.
North Spit ACEC	NA, A	Area would remain open to ORV use and mineral entry. Consequence: Some possible loss of special status plant and animal habitat, cultural and historic values.
	B, C, D, E, PA	Area would be designated as an ACEC and withdrawn from mineral entry. Consequence: Special status plant and animal habitat would be protected. Cultural and historic values protected.
Upper Rock Creek ACEC/RNA	NA	Totally protected as ecosystem diversity block.
	A	300 acres of timber harvest and 0.4 miles of road construction are included in the 10-year scenario. Consequnce: Disturbance of natural conditions would result in loss of ability to fill 1 RNA cell.
	B, C	Although area not designated as an ACEC/RNA, it would be protected through designation as a habitat diversity block. Consequence: Plant and animal habitat would be protected.
	D	Area would be designated as an RNA/ACEC. Consequence: Special status plant and animal habitat would be protected, and one RNA cell filled. Recreation development would be precluded.
	E, PA	Area would be designated as an ACEC. Consequence: Special status plant and animal habitat would be protected, as would recreational opportunities.

Special Area	Alternative	Probable Management Activities/ Major Consequences
North Fork Hunter Creek ACEC/RNA	NA, A	680 acres of timber harvest and 7.3 miles of road construcion are included in the 10-year scenario. Consequence: Possible loss of special status plant and animal habitat, ability to fill one RNA cell, and some cultural/historic values.
	B, C, D	Area would be designated as an RNA/ACEC. Consequence: One RNA cell would be filled, and special status plant and animal habitat would be protected. Cultural/historic values protected. Recreation development would be precluded.
	E, PA	Area would be designated as an ACEC. Consequence: Special status plant and animal habitat would be protected. Cultural/historic values and recreational opportunities protected. Reduced research opportunities in a totally undisturbed environment.
Hunter Creek Bog ACEC/RNA	NA, A	20 acres of timber harvest and 0.2 miles of road construction are included in the 10-year scenario. Mineral activity permitted without approved plan of action. Consequence: Possible loss of special status plant and animal habitat, and inability to fill two RNA cells.
	B, C, D	Area would be designated as an RNA/ACEC. Consequence: Two RNA cells would be filled, and special status plant and animal habitat would be protected. Recreation development would be precluded, and mineral development restricted.
	E, PA	Area would be designated as an ACEC. Consequence: Special status plant and animal habitat would be protected, as would recreational opportunities. Mineral development would be restricted, and research opportunities reduced.
North Fork Chetco River RNA/ACEC	NA, A, B	130 acres of timber harvest and 1.1 miles of road construction are included in the 10-year scenario. Consequence: Disturbance of natural conditions would result in loss of ability to fill two RNA cells. Possible loss of some cultural values.

Special Area	Alternative	Probable Management Activities/ Major Consequences
	C, D	Area would be designated as an RNA/ACEC. Consequence: Two RNA cells would be filled, and plant and animal habitat would be protected. Cultural values protected.
	E, PA	Area would be designated as an ACEC. Consequence: Plant and animal habitat would be protected. Cultural values protected.

Appendix IV-K
Acres Harvested by Age Class by Decade

Table IV-K-1. No Action (NA) Alternative (ASQ 254 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49		8,000	36,400	29,400	
50-59		9,400	7,900		
60-79		18,400			15,200
80-99		7,900			
100-199	19,000	14,800			200
200+	18,300	200	200	200	
Total	37,300	58,700	44,500	29,600	15,400

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39	7,300	27,200	40,800	30,700	23,500
40-49		6,200		16,000	26,900
50-59					31,900
60-79					53,700
80-99					
100-199					
200+					
Total	7,300	33,400	40,800	46,700	136,000

Total Acres (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39	7,300	27,200	40,800	30,700	23,500
40-49		14,200	36,400	45,400	26,900
50-59		9,400	7,900		31,900
60-79		18,400			68,900
80-99		7,900			
100-199	19,000	14,800			200
200+	18,300	200	200	200	
Total	44,600	92,100	85,300	76,300	151,400

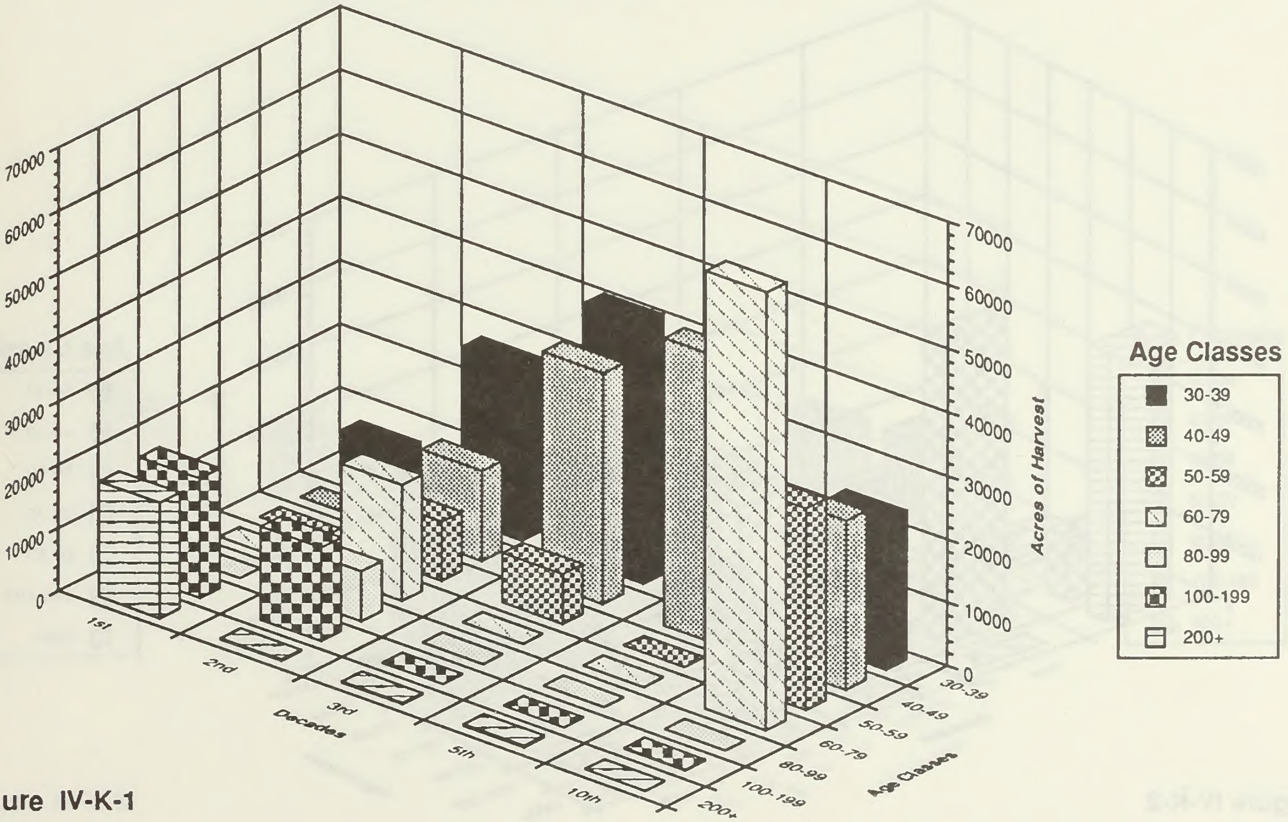

Figure IV-K-1

Appendix IV-K
Acres Harvested by Age Class by Decade

Table IV-K-2. Alternative A (ASQ 294 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49					15,700
50-59			21,600	30,000	26,200
60-79			21,800	6,600	
80-99		4,200	7,600		
100-199	9,700	47,300			
200+	41,700				
Total	51,400	51,500	51,000	36,600	41,900

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	12,500				17,900
50-59					
60-79					
80-99					
100-199					
200+					
Total	12,500	0	0	0	17,900

Total Acres (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	12,500				33,600
50-59			21,600	30,000	26,200
60-79			21,800	6,600	
80-99		4,200	7,600		
100-199	9,700	47,300			
200+	41,700				
Total	63,900	51,600	51,000	36,600	59,800

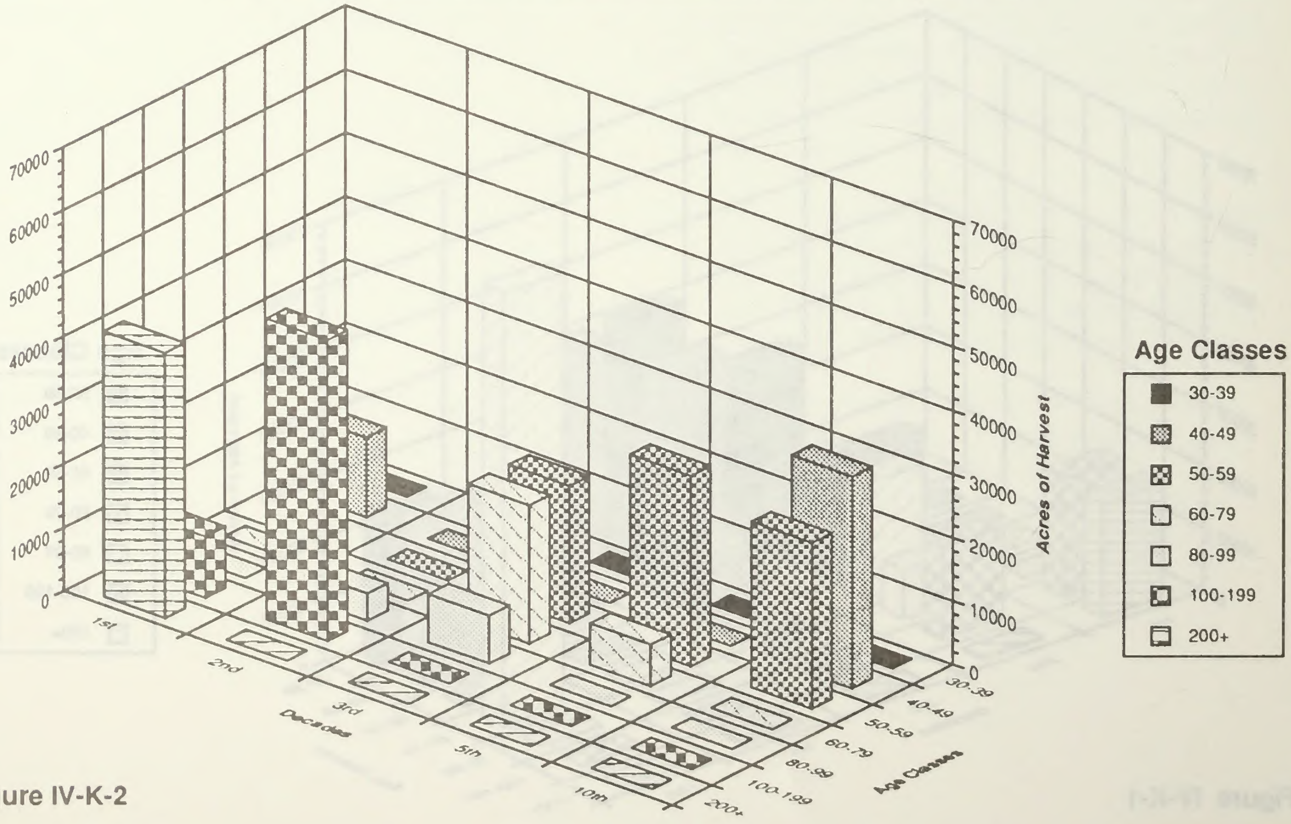

Figure IV-K-2

Appendix IV-K
Acres Harvested by Age Class by Decade

Table IV-K-3. Alternative B (ASQ 267 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					4,000
40-49			6,800	9,400	39,600
50-59			22,200	30,300	3,300
60-79		11,700	14,000	1,800	
80-99		5,500			
100-199	17,600	30,400			
200+	32,400				
Total	50,000	47,600	43,000	41,500	46,900

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	4,600				
50-59					
60-79					
80-99					
100-199					
200+					
Total	4,600	0	0	0	0

Total Acres (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					4,000
40-49	4,600		6,800	9,400	39,600
50-59			22,200	30,300	3,300
60-79		11,700	14,000	1,800	
80-99		5,500			
100-199	17,600	30,400			
200+	32,400				
Total	54,600	47,600	43,000	41,500	46,900

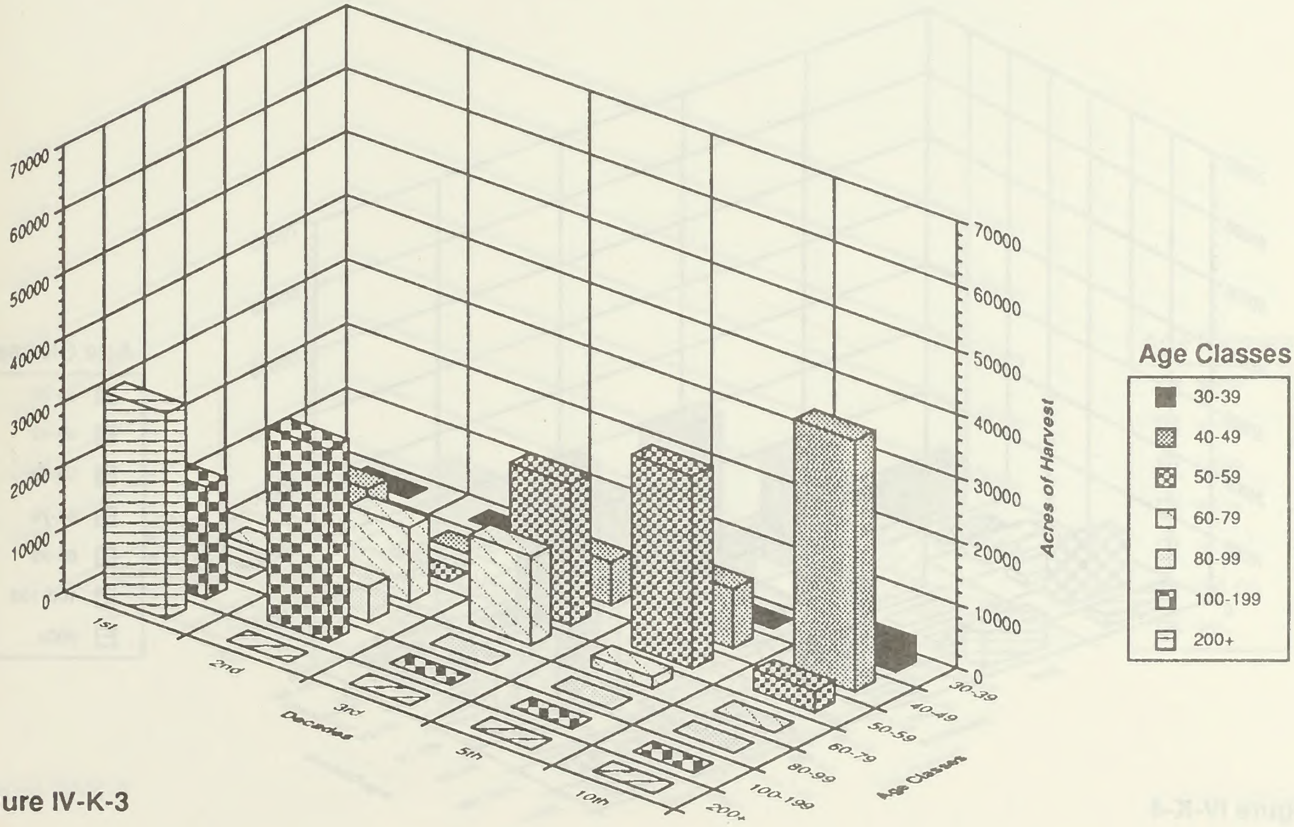

Figure IV-K-3

Appendix IV-K

Acres Harvested by Age Class by Decade

Table IV-K-4. Alternative C (ASQ 86 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49					
50-59					
60-79	2,200	8,800			900
80-99	1,400		2,500		
100-199	8,300		5,700		
200+	1,500	5,300			7,800
Total	13,400	14,100	8,200	0	8,700

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	7,000	16,800	27,400	26,500	1,400
50-59					
60-79				15,100	11,000
80-99					
100-199					
200+					
Total	7,000	16,800	27,400	41,600	12,400

Total Acres (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	7,000	16,800	27,400	26,500	1,400
50-59					
60-79	2,200	8,800		15,100	11,900
80-99	1,400		2,500		
100-199	8,400		5,700		
200+	1,500	5,300			7,800
Total	20,500	30,900	35,600	41,600	21,100

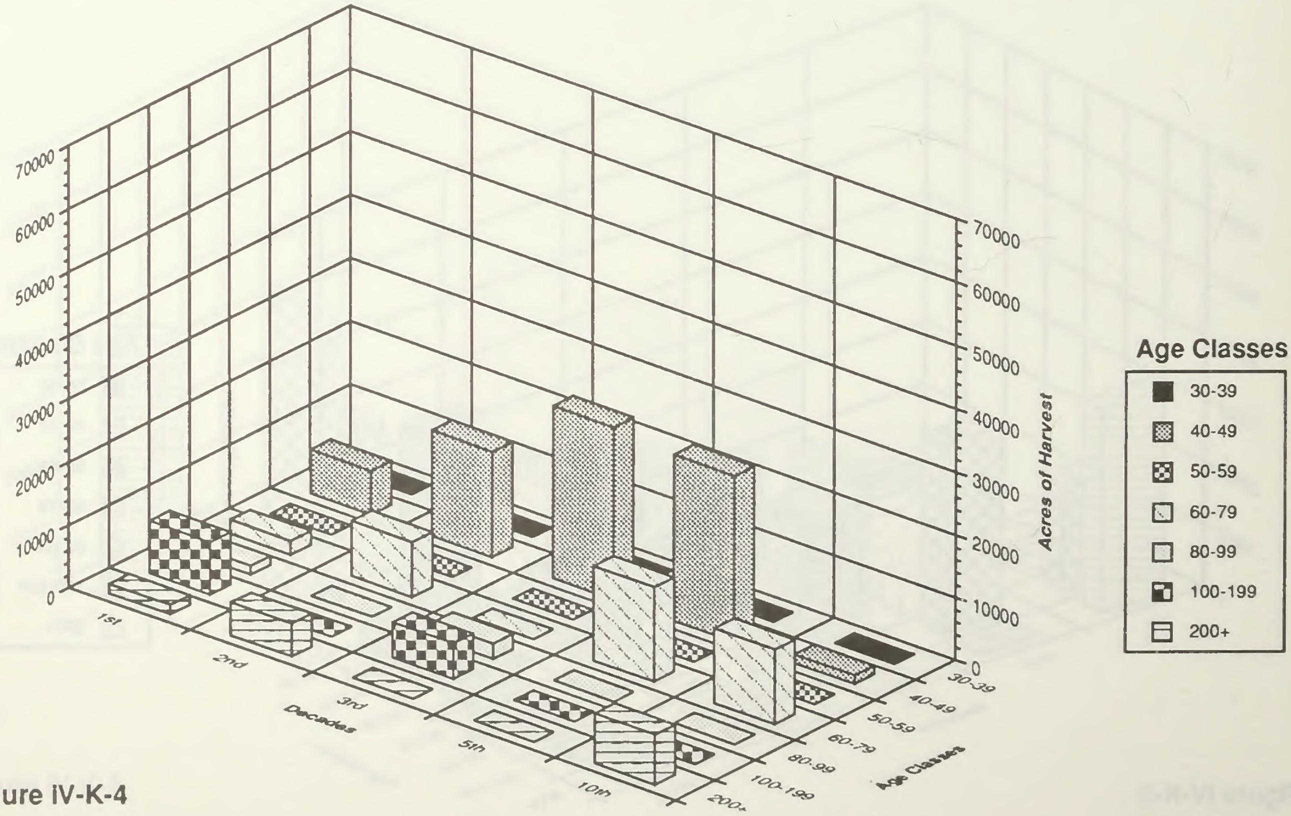

Figure IV-K-4

Appendix IV-K

Acres Harvested by Age Class by Decade

Table IV-K-5. Alternative D (ASQ 76 MMBF)

Final Harvest

	Decade				
Age	1	2	3	5	10
30-39					
40-49	100	600	1,300	700	1,600
50-59	900	400	1,900	1,300	2,500
60-79	1,000	2,200	3,500	10,900	12,000
80-99	500	400	1,300	4,200	7,300
100-199	7,000	5,500	6,400	6,900	500
200+	2,000	2,800	4,200	300	
Total	11,500	11,900	18,600	24,300	23,900

Thinning/Density Management

	Decade				
Age	1	2	3	5	10
30-39					
40-49	3,700	9,400	13,400	12,600	12,700
50-59	6,600				
60-79					
80-99					
100-199					
200+					
Total	10,300	9,400	13,400	12,600	12,700

Total Acres (Final Harvest & Thinning)

	Decade				
Age	1	2	3	5	10
30-39					
40-49	3,800	10,000	14,700	13,300	14,300
50-59	7,500	400	1,900	1,300	2,500
60-79	1,000	2,200	3,500	10,900	12,000
80-99	500	400	1,300	4,200	7,300
100-199	7,000	5,500	6,400	6,900	500
200+	2,000	2,800	4,200	300	
Total	21,800	21,300	32,000	36,900	36,600

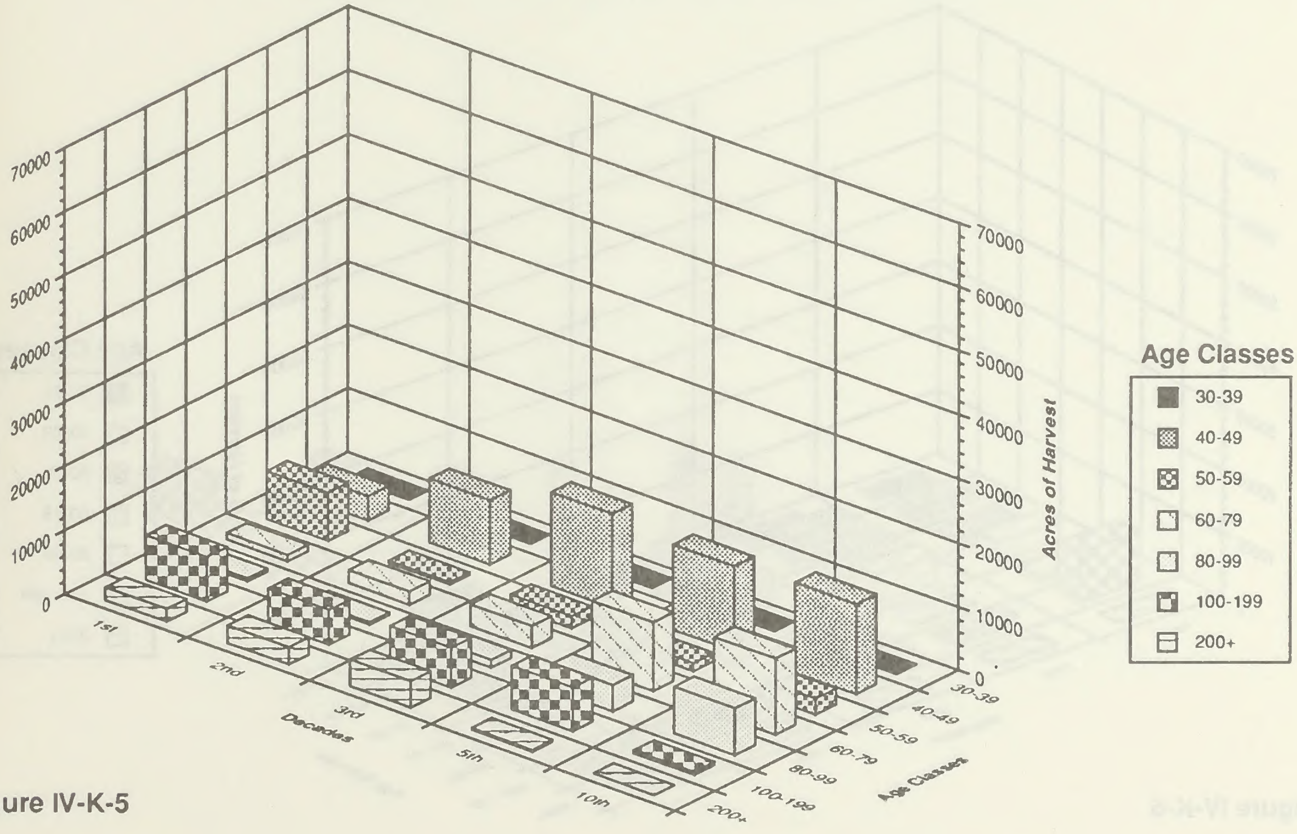

Figure IV-K-5

Appendix IV-K
Acres Harvested by Age Class by Decade

Table IV-K-6. Alternative E (ASQ 65 MMBF)

Final Harvest

	Decade				
Age	1	2	3	5	10
30-39					
40-49		4,100	8,300	7,400	4,600
50-59	600	4,300	5,100	3,600	3,700
60-79	3,000	4,500			
80-99	1,000				
100-199	8,000	1,500	1,500	1,500	1,500
200+					
Total	12,600	14,400	14,900	12,500	9,800

Thinning/Density Management

	Decade				
Age	1	2	3	5	10
30-39					
40-49	2,100				7,100
50-59					
60-79					
80-99					
100-199					
200+					
Total	2,100	0	0	0	7,100

Total Acres (Final Harvest & Thinning)

	Decade				
Age	1	2	3	5	10
30-39					
40-49	2,100	4,100	8,300	7,400	11,700
50-59	600	4,300	5,100	3,600	3,700
60-79	3,000	4,500			
80-99	1,000				
100-199	8,000	1,500	1,500	1,500	1,500
200+					
Total	14,700	14,400	14,900	12,500	16,900

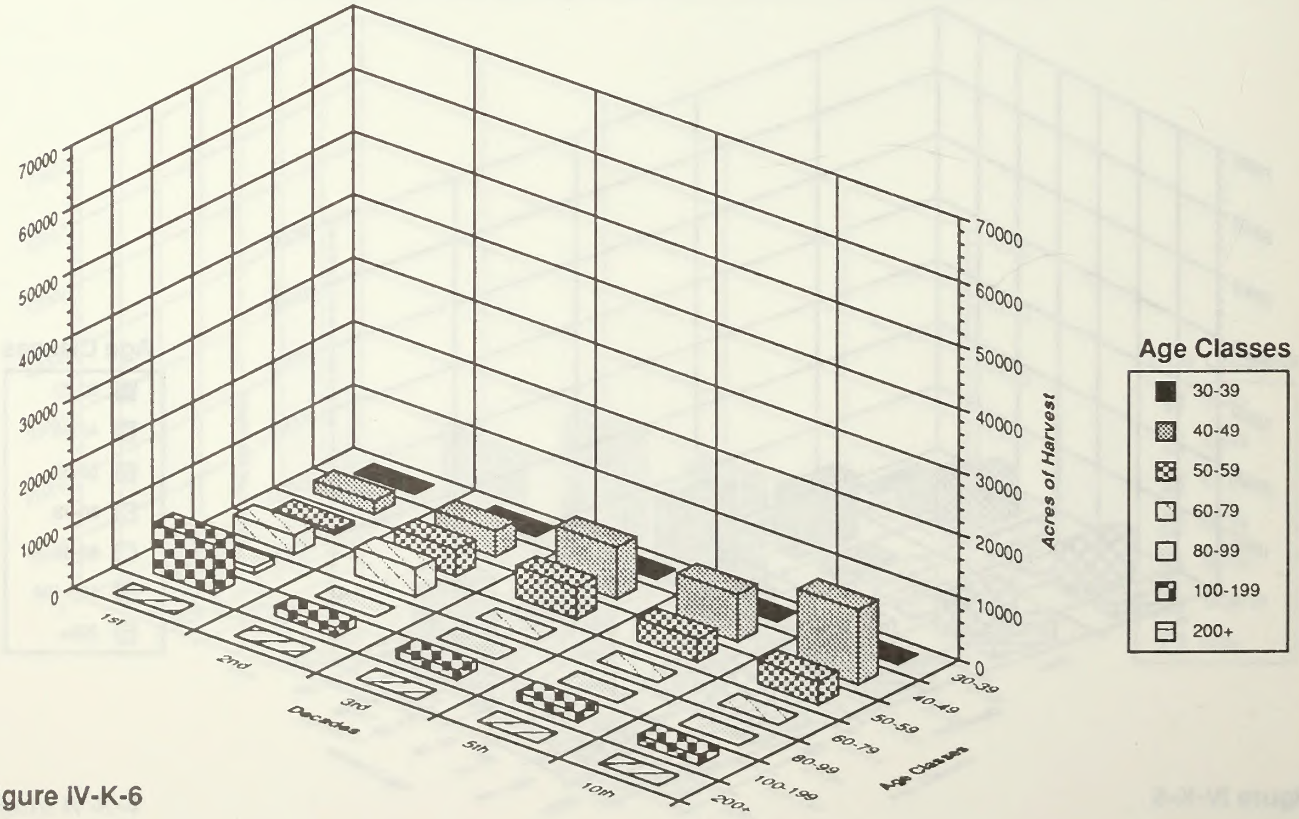

Figure IV-K-6

Appendix IV-K

Acres Harvested by Age Class by Decade

Table IV-K-7. Preferred Alternative (PA) (ASQ 124 MMBF)

Final Harvest

Age	Decade 1	2	3	5	10
30-39					
40-49					
50-59	1,000	600	1,200		
60-79	1,500	3,700	12,800	12,200	8,500
80-99	800	2,700	1,900	1,300	4,700
100-199	17,400	11,800	300	200	4,000
200+	2,400	4,900	2,800		1,000
Total	23,100	23,700	19,000	13,700	18,200

Thinning/Density Management

Age	Decade 1	2	3	5	10
30-39					
40-49	5,900	10,200	17,000	25,800	7,700
50-59	600			100	100
60-79	1,500		100	5,400	200
80-99	1,500				100
100-199					
200+					
Total	9,500	10,200	17,100	31,300	8,100

Total Acres (Final Harvest & Thinning)

Age	Decade 1	2	3	5	10
30-39					
40-49	5,900	10,200	17,000	25,800	7,700
50-59	1,600	600	1,200	100	100
60-79	3,000	3,700	12,900	17,600	8,700
80-99	2,300	2,700	1,900	1,300	4,800
100-199	17,400	11,800	300	200	4,000
200+	2,400	4,900	2,800		1,000
Total	32,600	33,900	36,100	45,000	26,300

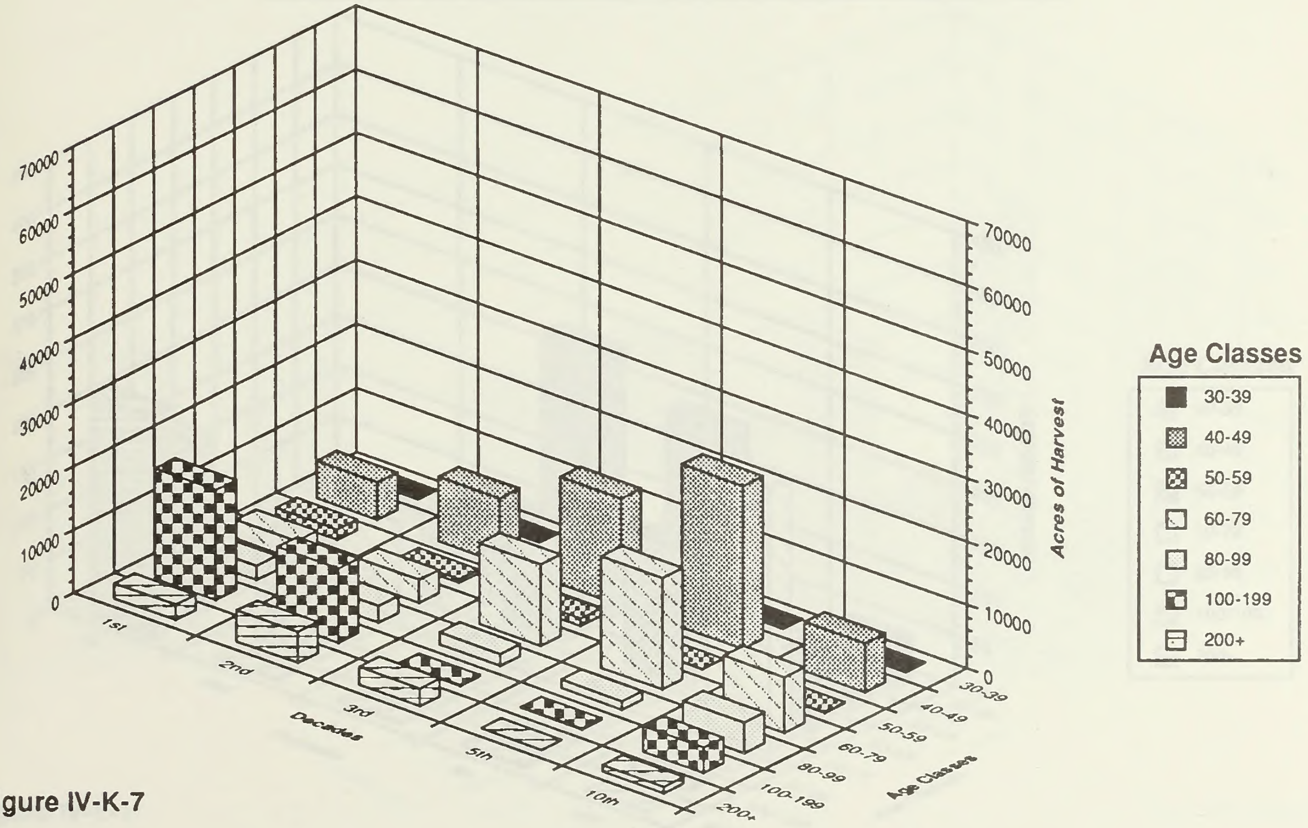

Figure IV-K-7

Appendix IV-L

Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-1. No Action Alternative (NA) (ASQ 254 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49		36.44	266.48	206.06	
50-59		39.87	69.72	115.76	
60-79		95.69			193.69
80-99		55.45			
100-199	171.97	120.38			2.95
200+	218.21	2.95	2.95	2.95	
Total	390.18	350.78	339.15	324.77	196.64

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39	10.96	41.08	61.99	52.12	44.20
40-49		9.27		24.24	45.73
50-59					45.86
60-79					68.71
80-99					
100-199					
200+					
Total	10.96	50.35	61.99	76.36	204.50

Total Volume (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39	10.96	41.08	61.99	52.12	44.20
40-49		45.71	266.48	230.30	45.73
50-59		39.87	69.72	115.76	45.86
60-79		95.69			262.40
80-99		55.45			
100-199	171.97	120.38			2.95
200+	218.21	2.95	2.95	2.95	
Total	401.14	401.13	401.14	401.13	401.14

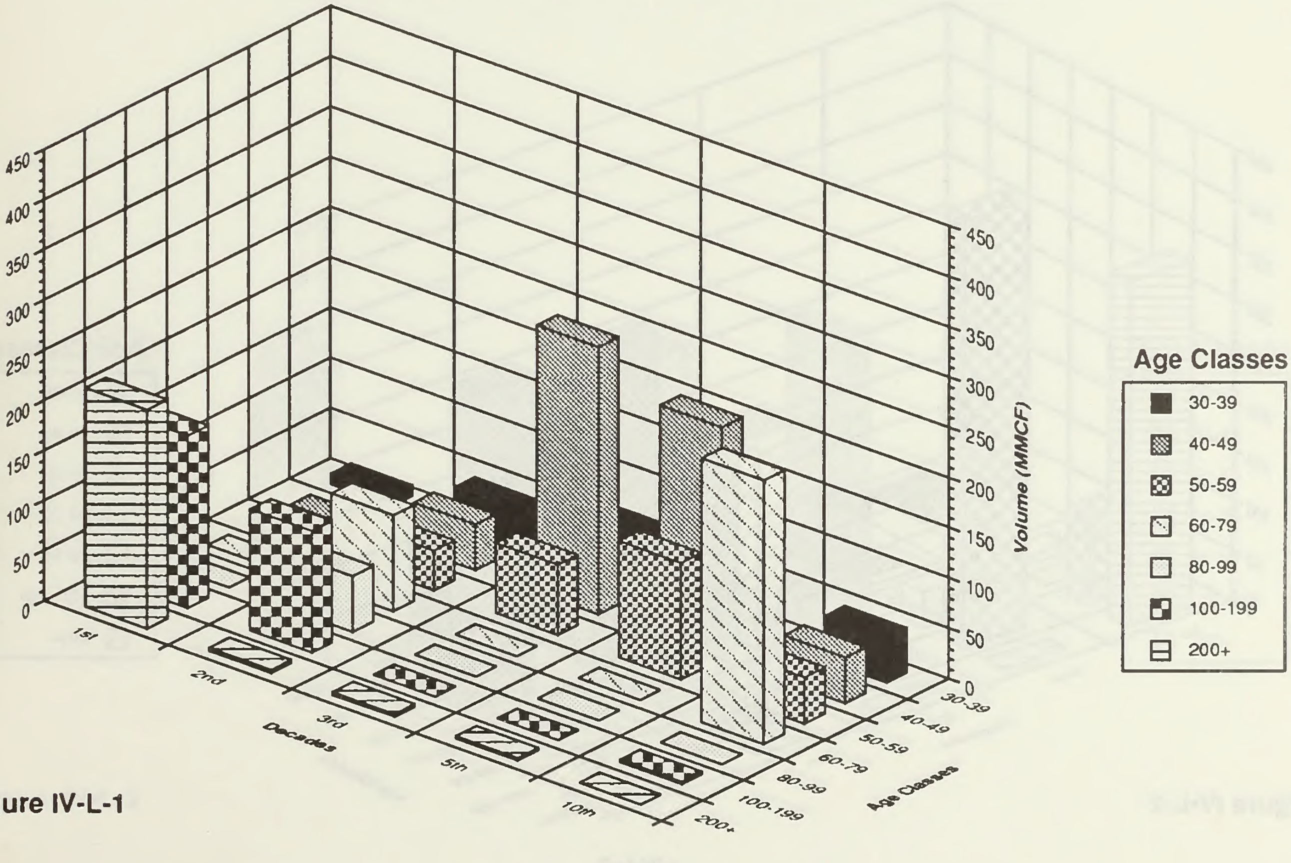

Figure IV-L-1

Appendix IV-L
Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-2. Alternative A (ASQ 294 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49					92.86
50-59			193.02	319.22	320.63
60-79			197.40	142.95	
80-99		36.13	71.75		
100-199	90.40	426.04			
200+	344.18				
Total	434.58	462.17	462.17	462.17	413.49

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	27.58				48.68
50-59					
60-79					
80-99					
100-199					
200+					
Total	27.58	0	0	0	48.68

Total Volume (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	27.58				141.54
50-59			193.02	319.22	320.63
60-79			197.40	142.95	
80-99		36.13	71.75		
100-199	90.40	426.04			
200+	344.18				
Total	462.16	462.17	462.17	462.17	462.17

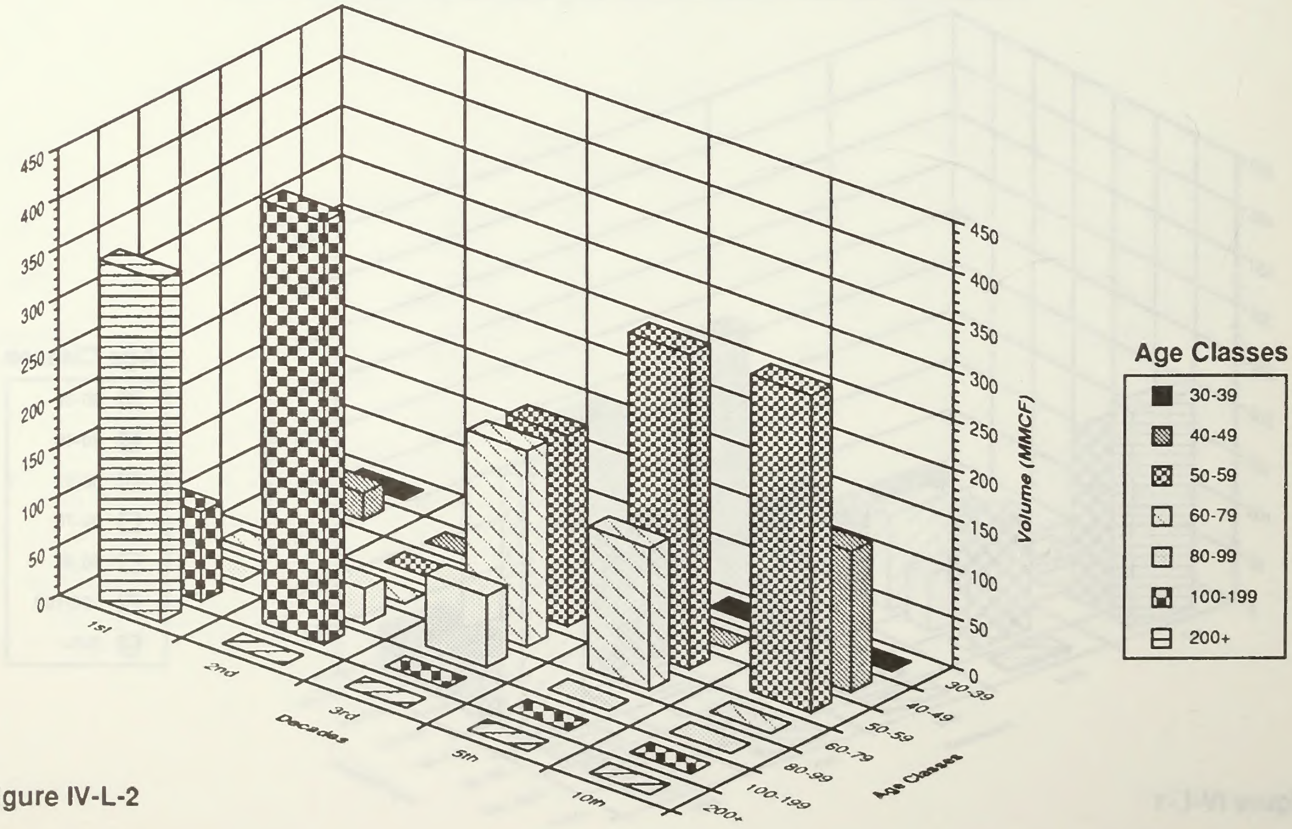

Figure IV-L-2

Appendix IV-L

Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-3. Alternative B (ASQ 267 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					18.22
40-49			75.07	65.78	353.36
50-59			199.20	322.94	47.11
60-79		84.99	144.42	29.96	
80-99		51.17			
100-199	140.95	282.53			
200+	267.77				
Total	408.72	418.69	418.69	418.68	418.69

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	9.96				
50-59					
60-79					
80-99					
100-199					
200+					
Total	9.96	0	0	0	0

Total Volume (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					18.22
40-49	9.96		75.07	65.78	353.36
50-59			199.20	322.94	47.11
60-79		84.99	144.42	29.96	
80-99		51.17			
100-199	140.95	282.53			
200+	267.77				
Total	418.68	418.69	418.69	418.68	418.69

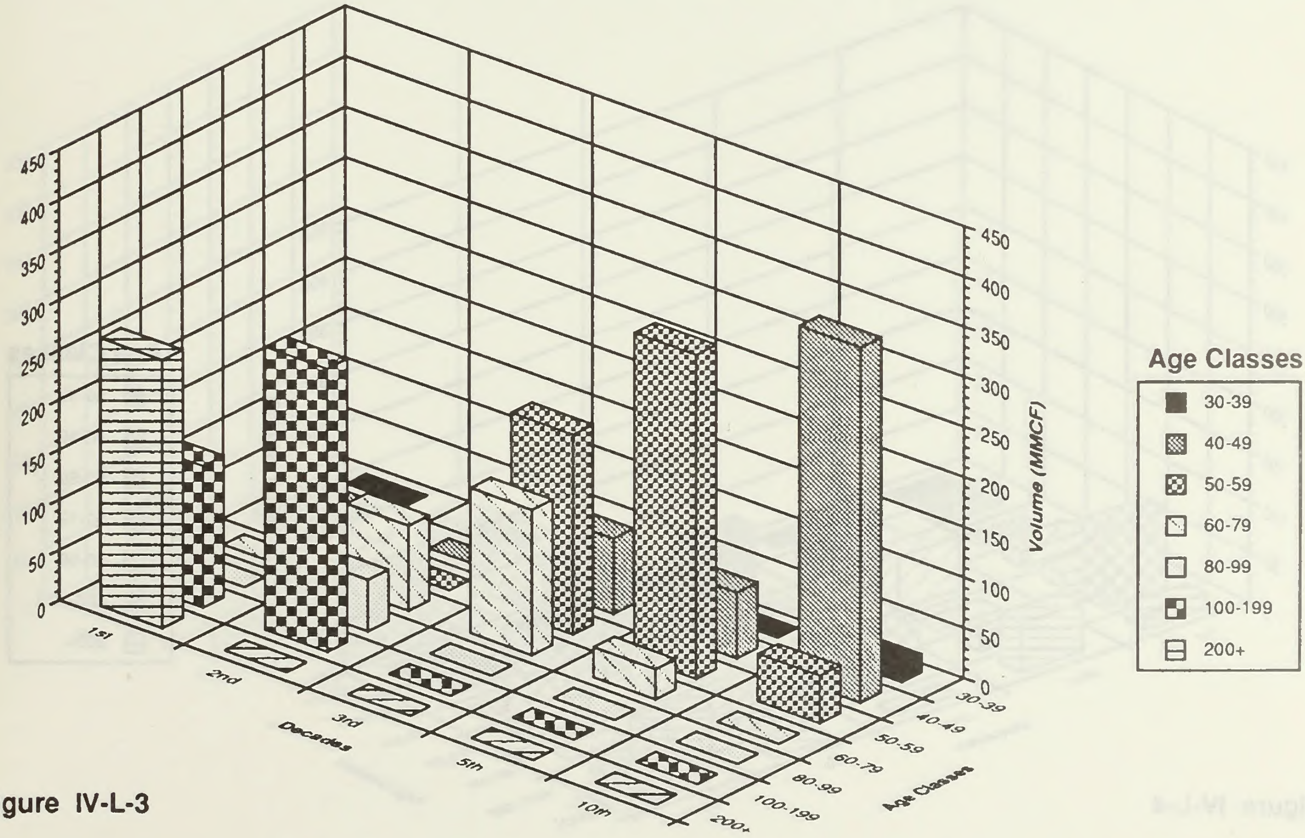

Figure IV-L-3

Appendix IV-L
Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-4. Alternative C (ASQ 86 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49					
50-59					
60-79	15.72	52.50			5.64
80-99	13.61		22.46		
100-199	80.29		53.62		
200+	14.32	48.45			73.94
Total	123.94	100.95	76.08	0	79.58

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	16.29	39.26	64.13	61.78	3.28
50-59					
60-79				78.43	57.36
80-99					
100-199					
200+					
Total	16.29	39.26	64.13	140.21	60.64

Total Volume (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	16.29	39.26	64.13	61.78	3.28
50-59					
60-79	15.72	52.50		78.43	63.00
80-99	13.61		22.46		
100-199	80.29		53.62		
200+	14.32	48.45			73.94
Total	140.23	140.21	140.21	140.21	140.22

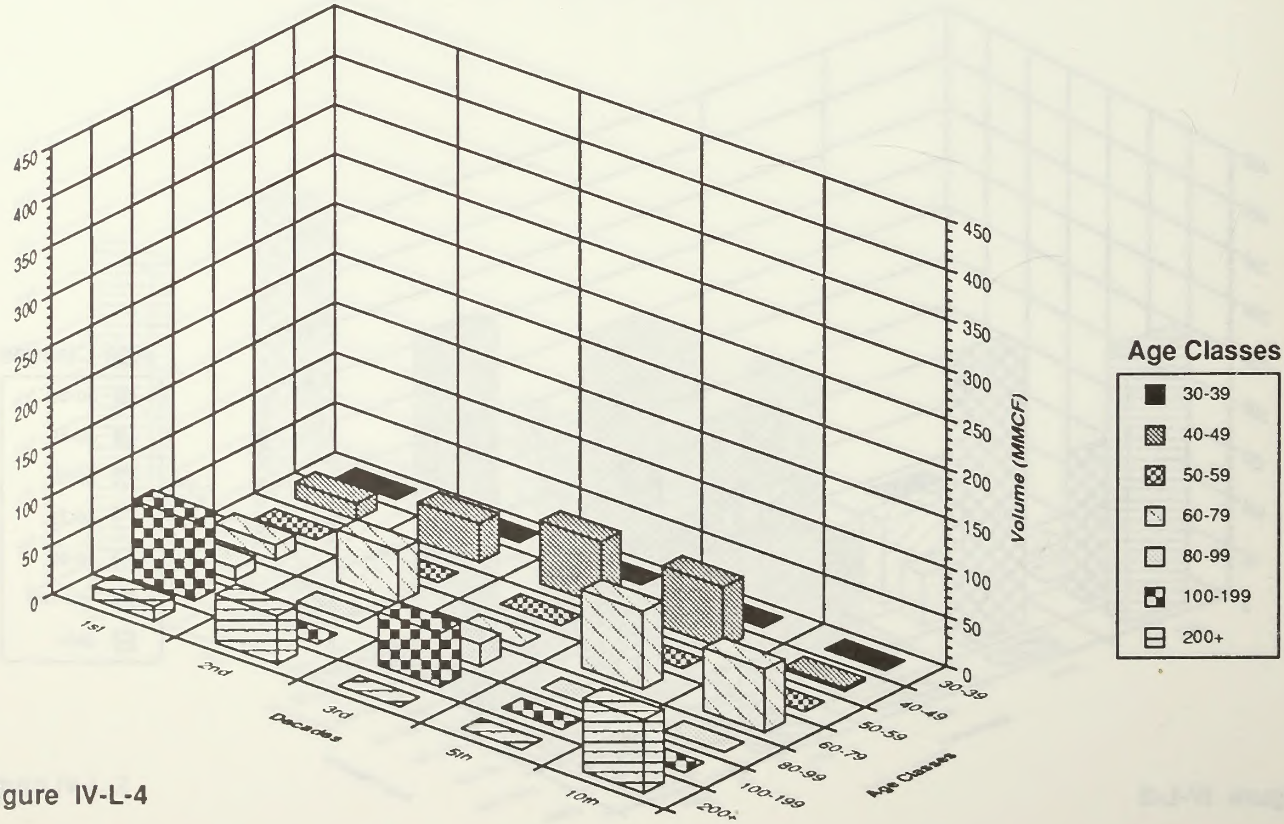

Figure IV-L-4

Appendix IV-L

Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-5. Alternative D (ASQ 76 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49		3.38	8.70	5.21	10.99
50-59	5.69	2.84	14.47	11.86	22.37
60-79	8.22	16.80	28.95	111.14	134.96
80-99	4.55	3.59	13.09	44.07	99.45
100-199	72.96	61.15	75.68	88.71	7.13
200+	20.08	28.84	42.61	3.11	
Total	111.50	116.60	183.50	264.10	274.90

Thinning/Density Management					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	7.56	18.40	27.80	25.70	26.80
50-59	15.94				
60-79					
80-99					
100-199					
200+					
Total	23.50	18.40	27.80	25.70	26.80

Total Volume (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	7.56	21.78	36.50	30.91	37.79
50-59	21.63	2.84	14.47	11.86	22.37
60-79	8.22	16.80	28.95	111.14	134.96
80-99	4.55	3.59	13.09	44.07	99.45
100-199	72.96	61.15	75.68	88.71	7.13
200+	20.08	28.84	42.61	3.11	
Total	135.00	135.00	211.30	289.80	301.70

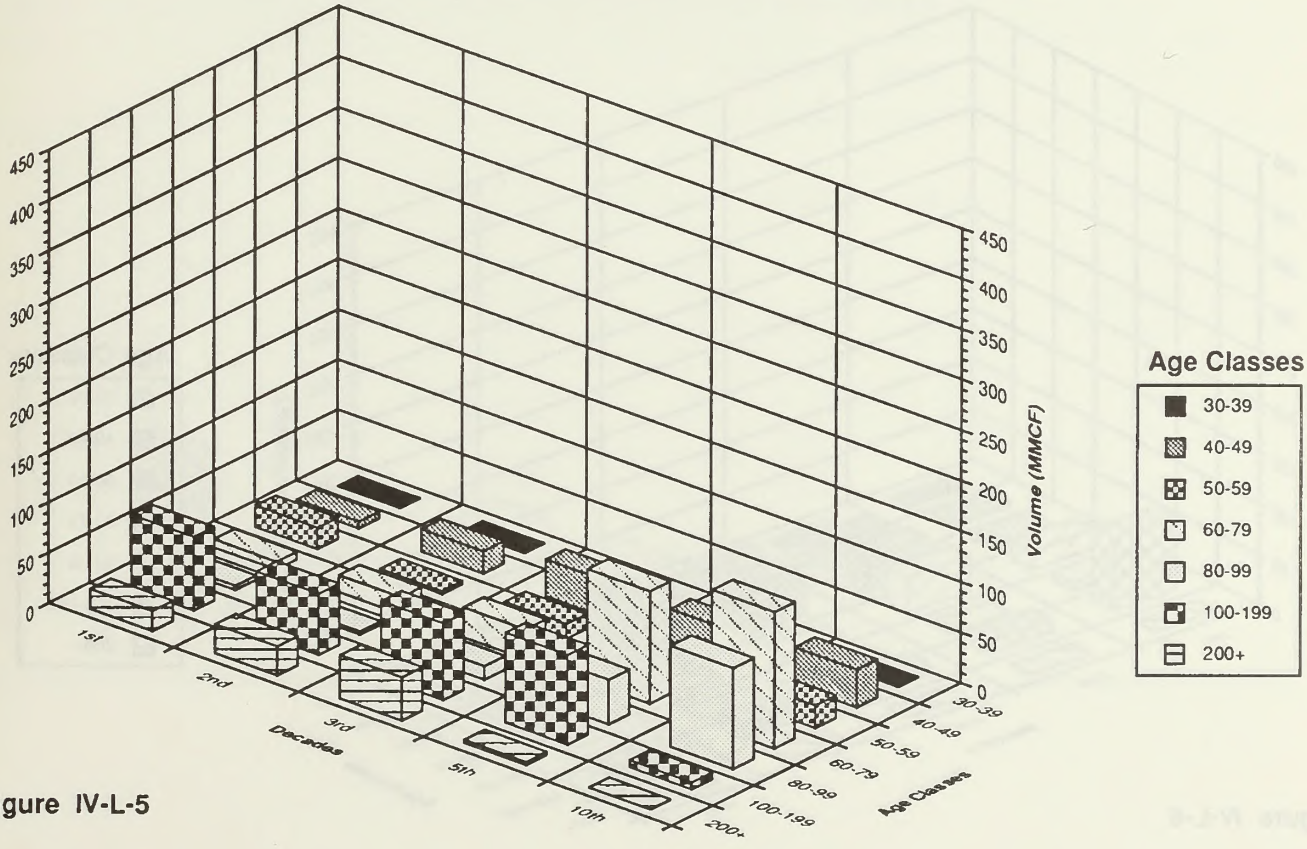

Figure IV-L-5

Appendix IV-L

Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-6. Alternative E (ASQ 65 MMBF)

Final Harvest					
	Decade				
Age	1	2	3	5	10
30-39					
40-49		24.72	43.62	52.97	28.23
50-59	4.18	32.88	48.81	39.46	45.19
60-79	17.94	34.83			
80-99	7.87				
100-199	72.10	14.18	14.18	14.18	14.18
200+					
Total	102.09	106.61	106.61	106.61	87.60

Thinning/Density Management					
	Decade				
Age	1	2	3	6	10
30-39					
40-49	4.51				19.01
50-59					
60-79					
80-99					
100-199					
200+					
Total	4.51	0	0	0	19.01

Total Volume (Final Harvest & Thinning)					
	Decade				
Age	1	2	3	5	10
30-39					
40-49	4.51	24.72	43.62	52.97	47.24
50-59	4.18	32.88	48.81	39.46	45.19
60-79	17.94	34.83			
80-99	7.87				
100-199	72.10	14.18	14.18	14.18	14.18
200+					
Total	106.60	106.61	106.61	106.61	106.61

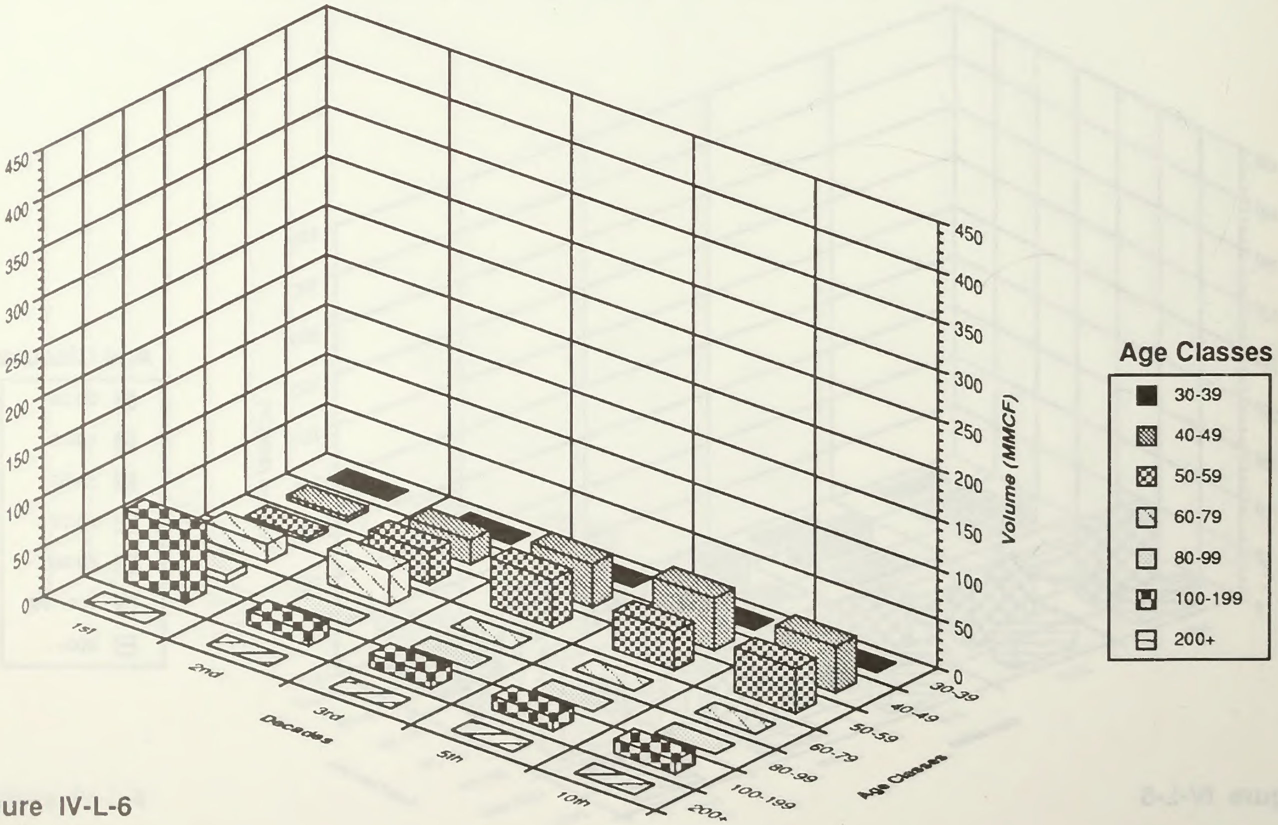

Figure IV-L-6

Appendix IV-L

Volume (MMCF) Harvested by Age Class by Decade

Table IV-L-7. Preferred Alternative (PA) (ASQ 124 MMBF)

Final Harvest

	Decade				
Age	1	2	3	5	10
30-39					
40-49					
50-59	1.42	0.86	1.72	0.05	
60-79	2.29	28.69	127.81	117.30	101.58
80-99	2.86	18.79	5.80	6.74	38.39
100-199	150.14	86.17	1.80	1.48	33.45
200+	19.19	43.00	25.05	0.15	8.56
Total	175.90	177.51	162.18	125.72	181.98

Thinning/Density Management

	Decade				
Age	1	2	3	5	10
30-39					
40-49	13.67	23.46	38.46	58.41	17.70
50-59	1.32			0.14	0.15
60-79	4.66		0.31	16.64	0.81
80-99	5.42			0.07	0.33
100-199					
200+					
Total	26.07	23.46	38.77	76.26	18.99

Total Volume (Final Harvest & Thinning)

	Decade				
Age	1	2	3	5	10
30-39					
40-49	13.67	23.46	38.46	58.41	17.70
50-59	2.74	0.86	1.72	0.19	0.15
60-79	6.95	28.69	128.12	133.94	102.39
80-99	8.28	18.79	5.80	6.81	38.72
100-199	150.14	86.17	1.80	1.48	33.45
200+	19.19	43.00	25.05	0.15	8.56
Total	200.97	200.97	200.95	200.98	200.97

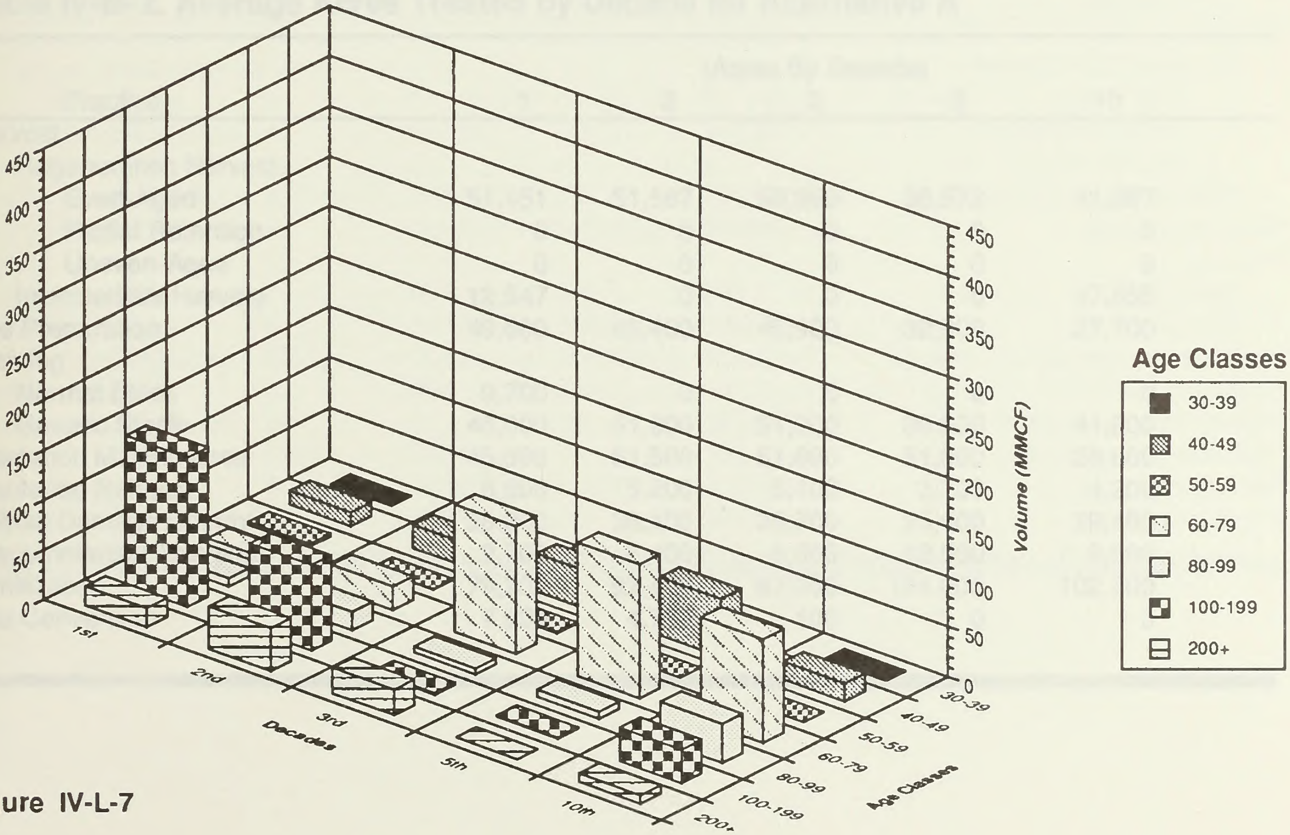

Figure IV-L-7

Appendix IV-M

Average Acres Treated by Decades and Alternatives

Table IV-M-1. Average Acres Treated by Decade for Alternative NA

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	37,297	58,714	45,505	29,608	15,411
Partial Retention	0	0	0	0	0
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	7,279	33,453	40,753	46,671	136,041
Site Preparation	38,200	52,800	39,900	37,300	16,000
Planting					
Normal Stock	4,200	7,100	0	0	0
Genetic Stock	37,700	51,600	44,300	41,500	17,800
Plantation Maintenance	46,600	37,300	58,700	44,300	41,500
Plantation Release	6,000	5,900	4,400	4,100	1,800
Animal Damage Control	29,300	41,100	31,000	29,000	12,500
Precommercial Thinning	40,800	35,500	31,300	35,600	23,000
Fertilization	48,000	70,600	76,600	82,200	150,700
Site Conversion	5,900	1,500	1,900	0	0

Table IV-M-2. Average Acres Treated by Decade for Alternative A

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	51,451	51,567	50,950	36,572	41,887
Partial Retention	0	0	0	0	0
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	12,547	0	0	0	17,855
Site Preparation	49,600	46,400	45,900	32,900	37,700
Planting					
Normal Stock	9,700	0	0	0	0
Genetic Stock	45,000	51,600	51,000	36,600	41,900
Plantation Maintenance	45,300	51,500	51,600	51,000	36,600
Plantation Release	6,800	5,200	5,100	3,700	4,200
Animal Damage Control	38,300	36,100	35,700	25,600	29,400
Precommercial Thinning	9,700	5,400	6,000	12,500	9,800
Fertilization	79,200	92,400	87,200	124,000	102,300
Site Conversion	7,900	4,700	100	0	0

Table IV-M-3. Average Acres Treated by Decade for Alternative B

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	49,986	47,588	42,936	41,508	46,895
Partial Retention	0	0	0	0	0
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	4,596	0	0	0	0
Site Preparation	47,500	42,900	38,600	37,400	42,200
Planting					
Normal Stock	8,100	0	0	0	0
Genetic Stock	44,400	47,600	42,900	41,500	46,900
Plantation Maintenance	44,500	50,000	47,600	42,900	41,500
Plantation Release	6,200	4,800	4,300	4,200	4,700
Animal Damage Control	36,700	33,300	30,100	29,000	32,900
Precommercial Thinning	4,700	4,900	3,600	11,200	11,400
Fertilization	69,900	89,200	76,000	109,100	82,0000
Site Conversion	10,400	900	0	0	0

Table IV-M-4. Average Acres Treated by Decade for Alternative C

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	0	0	0	0	0
Partial Retention	13,508	14,066	8,178	0	8,766
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	7,027	16,792	27,448	41,568	12,392
Site Preparation	14,000	12,700	7,400	0	7,900
Planting					
Normal Stock	7,700	7,000	4,100	0	4,400
Genetic Stock	7,700	7,000	4,100	0	4,400
Plantation Maintenance	43,800	13,500	14,100	8,200	4,000
Plantation Release	2,300	1,400	800	0	900
Animal Damage Control	10,700	9,800	5,700	0	6,100
Precommercial Thinning	8,800	3,600	2,800	900	2,200
Fertilization	47,300	58,600	58,600	44,600	41,400
Site Conversion	5,200	500	800	0	0

Table IV-M-5. Average Acres Treated by Decade for Alternative D

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	11,507	11,853	18,620	24,287	23,887
Partial Retention	0	0	0	0	0
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	10,304	9,378	13,374	12,631	12,714
Site Preparation	13,200	10,400	16,800	21,900	21,500
Planting					
Normal Stock	0	0	0	0	0
Genetic Stock	14,300	11,600	18,600	24,300	23,900
Plantation Maintenance	44,800	11,500	11,600	18,600	24,300
Plantation Release	2,600	1,200	1,900	2,400	2,400
Animal Damage Control	10,000	8,100	13,000	17,000	16,700
Precommercial Thinning	2,100	6,000	2,900	4,700	5,400
Fertilization	33,500	61,200	53,500	35,800	35,400
Site Conversion	8,200	600	800	0	0

Table IV-M-6. Average Acres Treated by Decade for Alternative E

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	12,639	14,451	14,860	12,585	9,821
Partial Retention	0	0	0	0	0
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	2,085	0	0	0	7,120
Site Preparation	12,200	13,000	13,400	11,300	8,900
Planting					
Normal Stock	0	0	0	0	0
Genetic Stock	13,400	14,500	14,900	12,600	9,900
Plantation Maintenance	42,800	12,600	14,500	14,900	12,600
Plantation Release	1,700	1,400	1,500	1,300	1,000
Animal Damage Control	9,400	10,100	10,400	8,800	6,900
Precommercial Thinning	2,900	1,500	1,400	3,200	2,600
Fertilization	25,900	26,300	22,000	27,600	28,800
Site Conversion	2,400	400	300	0	0

Table IV-M-7. Average Acres Treated by Decade for Alternative PA

	(Acres By Decade)				
Practice	1	2	3	5	10
Harvest					
Regeneration Harvest					
Even-Aged	23,157	23,702	18,969	13,718	18,189
Partial Retention	0	0	0	0	0
Uneven-Aged	0	0	0	0	0
Intermediate Harvest	9,560	10,211	17,113	31,326	8,117
Site Preparation	24,200	21,300	17,100	11,700	16,400
Planting					
Normal Stock	2,400	0	0	0	0
Genetic Stock	24,200	23,700	19,000	13,700	18,200
Plantation Maintenance	45,400	27,800	21,200	16,100	21,300
Plantation Release	3,600	2,400	1,900	1,400	1,800
Animal Damage Control	15,800	16,600	13,300	9,600	12,800
Precommercial Thinning	24,600	30,400	6,800	16,300	12,400
Fertilization	48,800	64,700	66,200	59,700	40,500
Site Conversion	6,900	700	2,300	200	0
Pruning	5,800	5,900	4,700	3,500	4,500

Appendix IV-N

Timber Supply Analysis For BLM Planning

The purpose of this analysis is to report regional stumpage price[1], timber harvest on all ownerships, and log consumption within geographically defined subregions (figure 1) resulting from implementing each of the five common resource management plan alternatives, as well as the preferred alternatives, on all U. S. Department of the Interior Bureau of Land Management (BLM) Districts in western Oregon. The analysis covers a period of initial plan implementation (1993-2000)[2] and the period thereafter (2001-2010). The baseline period that provides a historical benchmark for comparison was 1984-1988.

The purposes of this appendix are to: summarize key concepts used to conduct the analysis, provide a description of the procedures used, and briefly compare the analysis results to the baseline period and an earlier outlook of western Oregon timber supply (Sessions 1990). Results appear in Chapter 4 of the RMP/EIS describing the effects of alternatives. Specifically, the regional stumpage price results were used to calculate an index of BLM stumpage price changes (relative to the 1984-1988 baseline price). These price changes were then used in the assessment of personal income and employment effects. Harvest and log consumption results are presented in the timber supply tables of Chapter 4.

KEY CONCEPTS

Implemented on all Districts, each set of similar resource management plan alternatives represented a different timber supply policy, or alternative theme, for BLM administered lands in western Oregon. The question being addressed by this analysis is how do changes in BLM timber supply policy affect how much timber is harvested and consumed in subregions of western Oregon? The subregions in Figure 1 were explicitly interdependent through the transfer of logs from one subregion to another. The importance of subregions was in their partitioning of western Oregon into areas that differed in ownership distribution, private timber availability, and silvicultural management, while at the same time serving as logical reporting areas for western Oregon BLM Districts (see Table IV-N-1).

This analysis recognized that the BLM is just one timber supplier within western Oregon and that the impact of harvest changes is felt where the timber is actually consumed. Furthermore, any measure of the timber harvest and related consumption consequences of BLM actions must account for how the private land ownership reacts to changes in BLM timber supply policy. The amount of timber offered for sale by the BLM affects stumpage prices and these effects influence the decision of private forestland owners to harvest their timber. The result is an inverse relationship between the amount of BLM timber offered and the amount of private timber harvest.

The amount of timber demanded by processing mills is inversely related to stumpage prices. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category, such as end use consumption in the national economy (for example, the number of new homes being built) and other national economic variables like gross domestic product and the interest rate. Poor demand years result in low levels of consumption and low product prices; good years feature the same level of consumption under higher product prices. For the purpose of this analysis, year to year fluctuations in timber demand were averaged over a 10 year analysis period.

Timber supply is determined by ownership, subregional location, and stand condition. Ownership determines the policy specifying the conditions under which the timber may be harvested. Subregional location accounts for variations in species composition and the amount of timber available for harvest. Stand condition measures the amount of harvestable volume available on a per acre basis, as well as the growth rate and stage of development of this volume. Private timber supply is directly proportional to stumpage prices. This analysis accounted for changes in private timber supply by assessing inventory conditions at the beginning of each analysis period. For public agencies such as the USDA Forest Service and the BLM, timber supply is fixed at the planned allowable sale quantity; regardless of the stumpage price (down to a minimum acceptable bid), the same amount of timber would be harvested over the analysis period.

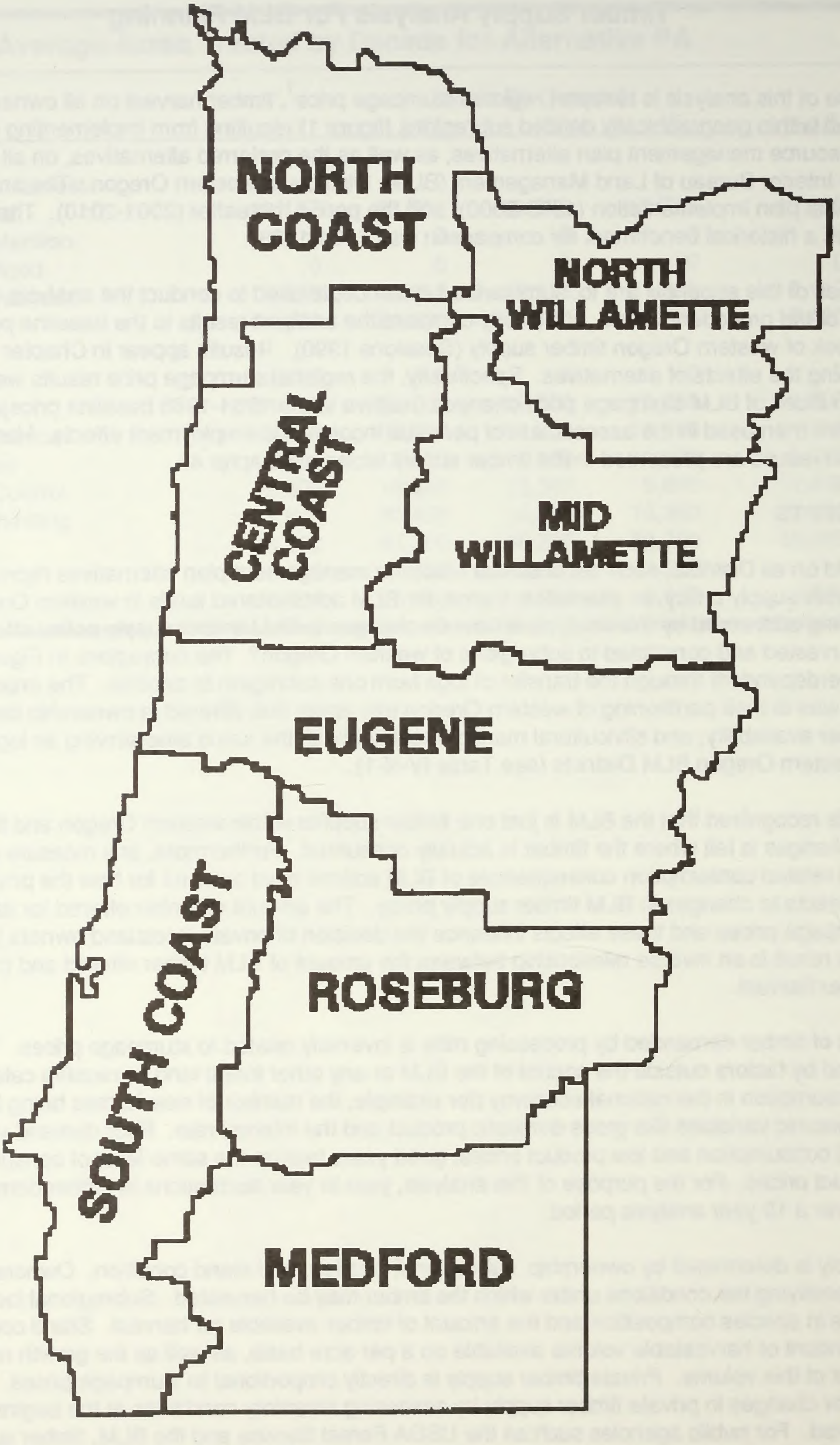

Figure 1. Western Oregon Subregion

Table IV-N-1. Subregion definitions for western Oregon

SUBREGION	WESTERN OREGON COUNTIES	REPORTING AREA FOR BLM DISTRICT
North Coast	*Clatsop, Columbia, Tillamook, Washington.*	Salem District
Central Coast	*Benton, Lincoln, Polk, Yamhill.*	Salem District
North Willamette	*Clackamas, Multnomah, Hood River.*	Salem District
Mid-Willamette	*Linn, Marion.*	Salem District
Eugene	*Lane.*	Eugene District
Roseburg	*Interior Douglas*[1]*.*	Roseburg District
South Coast	*Coos, Curry, and Coastal Douglas.*	Coos Bay District
Medford	*Jackson, Josephine.*	Medford District

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[1] The division between Coastal and Interior Douglas County follows the Coos Bay District boundary in Douglas County.

Market equilibrium defines a balance between timber supply and demand: the amount of timber harvested equals the amount of timber consumed and one stumpage price governs the exchange between suppliers and demanders. Implementing a new BLM timber policy will disrupt this balance and leads to adjustments in the stumpage price such that a new timber supply and demand balance is created. In this analysis, market equilibrium is explicitly recognized for the Pacific Northwest - westside region, and this implies a local equilibrium within western Oregon subregions.

PROCEDURES

The procedures used for the 1991-2000 period were: solving regional market equilibrium, disaggregation of the regional private harvest, displaying the timber harvest by ownership, and reapportioning the timber harvest as log consumption by processing facilities. Log exports from private and other public lands to foreign destinations was treated as domestic log consumption at the port of export.

In contrast, the procedures used over the 2001-2010 period were not dependent on a regional market equilibrium solution; rather the private harvest projections reflected the same behavioral response to the implemented resource management plans determined for the 1991-2000 period. This allowed the analysis to focus on whether the private inventory would provide a lower, same, or higher harvest over 2001-2010 when compared to the estimated 1991-2000 harvest.

Solving Regional Market Equilibrium; 1991-2000

This step determined the market adjustments, and associated regional stumpage price, that would result if a given set of resource management plan alternatives were implemented on BLM administered lands in western Oregon. The Timber Assessment Market Model (TAMM) (Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990) was used to calculate the new regional stumpage price balancing timber supply and demand. The Timber Assessment Market Model was ideal for this kind of analysis since the model provided 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector. The model is national is scope and is divided into 11 supply regions and 5 demand regions. Solution is in the form of a spatial supply and demand balance amongst regions. Therefore, the market equilibrium for the Pacific Northwest - westside region was dependent in part on what is happening in other regions of the U. S. Overall, the quantities produced and their distribution to demand regions is based on the maximization of producer profits net of transfer costs in each supply region.

The external policy condition that was changed for each TAMM run was the BLM sawtimber sale quantity resulting from holding each District in western Oregon at similar resource management plan alternatives. Four TAMM runs were made, each with a different resource management plan theme: current plans (i.e., no action), alternative A, alternative C, and the preferred alternative. Implementation of BLM resource management plans was assumed to commence in 1993. In order to reflect actual conditions since 1990, reported and estimated BLM sawtimber harvest quantities were used in 1991 and 1992 for all four runs. Similarly for 1991 National Forest harvest quantities. The National Forest sawtimber sale quantities for Pacific Northwest - westside forests in 1992 and beyond reflected planned offerings under the USDA Forest Service Spotted Owl Final Environmental Impact Statement, record of decision in March 1992 (U. S. Department of Agriculture 1992a and 1992b).

The key outputs for each TAMM run were the regional price and the total (hardwood and softwood) private growing stock removals for the Pacific Northwest - westside (PNWW) region. Growing stock removal was the relevant output because it represented the portion of total harvest that comes from the private inventory[3]. Annual removals from the industrial and other private ownership classes in TAMM (softwood and har&dwood volume combined) were summed to estimate the total private removal over the 1991-2000 period. The western Oregon share of the 1991-2000 PNWW total harvest was taken to be 0.4466, the historical 1971-1990 average of western Oregon's proportion of the total Pacific Northwest - westside private harvest (Figure 2).

In summary, the regional market equilibrium solution resulted in a Pacific Northwest - westside regional stumpage price and western Oregon's share of the corresponding private growing stock removals, given a set of similar resource management plan alternatives assumed implemented on BLM administered lands in western Oregon. Table IV-N-2 contains the results of the regional market equilibrium for each resource management plan theme. Results for alternatives B, D, and E were interpolations of the results of the TAMM runs for alternatives, A, C, current plans, and preferred.

Disaggregation of the Private Harvest; 1991-2000

The disaggregation of the private harvest into western Oregon subregions used Connaughton and Campbell's (1991) probability of stand harvest model. Throughout most of western Oregon, the regeneration harvest type was clearcut, the exception being the Medford subregion where the harvest was either clear cut or partial cut depending on even-aged or uneven-aged stand management. Commercial thinning treatments, if appropriate, were applied to non-regeneration harvest acres. Volumes removed from thinning contributed to the disaggregation of western Oregon's share of the TAMM private harvest.

The application of Connaughton and Campbell's (1991) model required: an updated 1990 year-end inventory, stand growth and yield projections for all private lands, and calibration for changes in federal timber policy on National Forests that occurred subsequent to the 1976-1984 period of estimation for Connaughton and Campbell's model. The calibration procedure resulted in a mechanism for adjusting the probability of stand harvest for different BLM timber supply policies. Given the same stand conditions, the higher the regional stumpage price under the BLM policy, the greater the probability of stand harvest.

Inventory and Growth Projections for Private Timberlands

The growth and yield of western Oregon's private forests were simulated by projecting future stand conditions on each of 789 field plots measured by personnel from the Pacific Northwest Research Station in 1984 and 1985, and reported in Gedney and others (1986a), (1986b), and 1987). The plots are laid out over western Oregon in a systematic grid, and each represents a specific number of acres (plot expansion factor) determined by its subregional location and ownership. The sum of the expansion factors for all projected plots in western Oregon was 5,864,163 acres. All plots were capable of producing at least 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Table IV-N-2. Regional market equilibrium results by BLM resource management plan theme.

Bureau of Land Management		TAMM Equilibrium Results	
Resource Management Plan Theme	Allowable Sawtimber Sale Quantity (mmcf/year)	1991-2000 Regional Stumpage Price (1967 $/mbf)	1993-2000 Western Oregon Private Growing Stock Removals (million cubic feet per year)
1984-1988 Historical	197	$37.56	602
NO ACTION[1]	186	$74.22	689
A[2]	245	$70.03	679
B	221	$71.66	682
C[3]	66	$82.07	704
D	77	$81.54	703
E	55	$82.87	706
PREFERRED[4]	94	$80.18	700

mbf - thousand board feet, long log scale.
mmcf/year - million cubic feet per year.

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[1] Timber Assessment Market Model (TAMM90), log run 582.

[2] Timber Assessment Market Model (TAMM90), log run 583.

[3] Timber Assessment Market Model (TAMM90), log run 584.

[4] Timber Assessment Market Model (TAMM90), log run 587.

Most field plots are composed of five sample points distributed over five acres, with observations on tree species, diameter, and height recorded for each point. The stands on each point were separately projected and then summed to represent forest condition for the plot. Some plots had either very young stands with no measurable volume or were yet to be regenerated, and these were projected as if a uniform number of trees of a typical species mix and number of seedlings were present on each point.

Two stand simulators were used to project the stand conditions for each inventory plot: the Stand Projection System (SPS), Version 2.3a (revised 8/1/91; Arney 1985), and the Oregon Growth Analysis and Projection System (ORGANON), Version 3.0 (Hester et al 1989). The Stand Projection System was used for plots located in all subregions except Medford and Roseburg; ORGANON was used in the latter two subregions.

Silvicultural management regimes, which are a set of activities to be carried out as the stand develops, were assigned to each plot. The regimes varied by stage of stand development (young stands, established stands) and location. Table 3 lists and summarizes the regimes, and shows the total number of acres represented by the plots assigned to each regime. The 1991-2000 disaggregation, and the 2001-2010 projection, of the

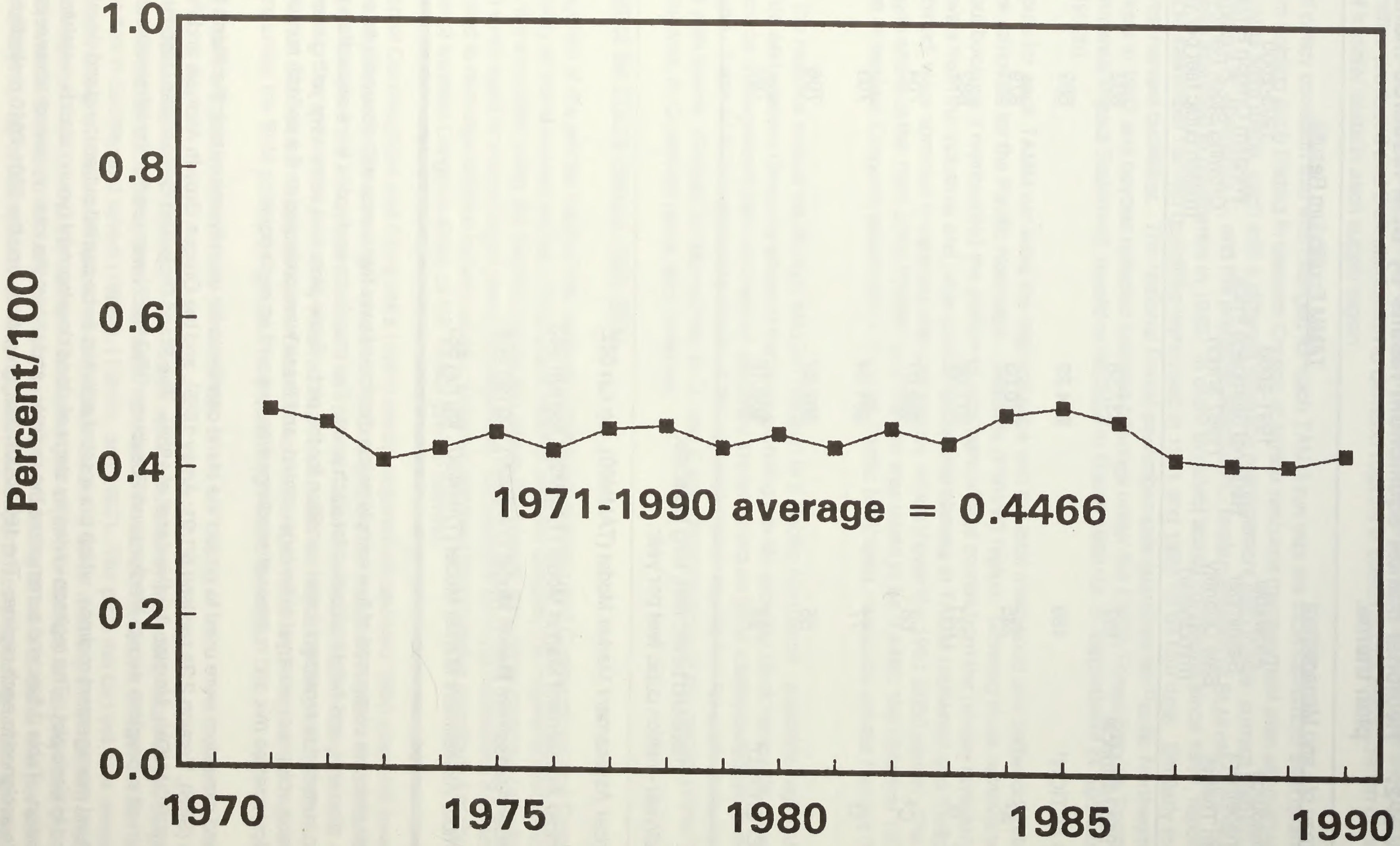

Figure 2. Western Oregon Private Timber Harvest as a Proportion of the Pacific Northwest Private

Table IV-N-3. Silvicultural management regimes used for projecting growth and yield for private lands in western Oregon

Name of Regime	Acres Assigned To Regime	Management Activities	Comments
RX1, RX1A	2,245,471	Clearcut.	Applied to established stands not eligible for or needing other activities; RX1A allows fertilizer on industrial land in decade prior to clearcut
RX2, RX2B	1,149,234	Commercial Thinning, Clearcut	Applied to established stands that have sufficient stocking to benefit from commercial thinning; RX2B allows fertilization on industrial land prior to both thinning and clearcut.
RX3, RX3A	471,345	Pre-commercial Thinning, Clearcut	Applied to young stands that would benefit from stocking control; generally on ground too steep for commercial thinning; RX3A allows fertilization prior to clearcut on industrial lands.
RX4, RX4B	544,904	Precommercial and Commercial Thinning, Clearcut	Applied to young stands that would benefit from stocking control and then benefit from commercial thinning prior to clearcut; RX4B allows fertilization prior to commercial thinning and clearcut on industrial lands.
RRX1	30,641	Establish Stand, Clearcut	Applies to bare land or newly regenerated stands, typically on low sites.
RRX3, RRX3A	177,794	Establish Stand, Precommercial Thinning, Clearcut	Applies to bare land or newly regenerated stands typically on ground too steep for commercial thinning; RRX3A allows for fertilizer on industrial ownership prior to clearcut.
RRX4, RRX4B	558,221	Establish Stand, Precommercial and Commercial Thinning, Clearcut	Applies to bare land or newly regenerated stands suitable for both pre-commercial and commercial thinning; RRX4B allows fertilizer on industrial ownership prior to commercial thinning and clearcut.
SWRX1	416,932	Clearcut/Partial Cut	Applied only in Medford subregion; same as RX1 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX2	78,202	Commercial Thinning, Clearcut/Partial Cut	Applied only in Medford subregion; same as RX2 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX3	50,320	Precommercial Thinning, Clearcut/Partial Cut	Applied only in Medford subregion; same as RX3 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX4	8,387	Precommercial and Commercial Thinning, Clearcut/Partial Cut	Applied only in Medford subregion; same as RX4 except allows for a partial cut or clearcut as the regeneration harvest.

Table IV-N-3. Silvicultural management regimes used for projecting growth and yield for private lands in western Oregon (continued)

Name of Regime	Acres Assigned To Regime	Management Activities	Comments
SWRX5	68,908	Brush Control Clearcut/Partial Cut	Applied only in Medford subregion; calls for brush control whenever stand is ineligible for pre-commercial thinning and 25% or more of trees are hardwoods.
None	63,779	Not Projected	Site not suitable for conifer growing stock or other factors precluding management.

private timber harvest were not heavily influenced by any management activity other than harvesting itself. Commercial thinning and fertilization both had minor effects on the results: the former because it contributed to harvest and altered stand development; the latter because it accelerated growth.

Stand conditions were updated to 1990 for land use changes and harvesting that had occurred since the plots were measured in the mid-1980s. Photo-interpretation, field checks, and county tax assessment records were used to conduct the update. Growth between the mid-1980s and 1990 was projected using either SPS or ORGANON, depending on the subregion in which the plot was located.

Calibration for Changes in Federal Timber Policies

The variables determining Connaughton and Campbell's (1991) probability of stand harvest model are the anticipated compound growth rate for the stand and the stand's growing stock volume. Both of these variables are structured as a function of the time interval within which the probability of stand harvest applies. For example, Connaughton and Campbell's model was estimated using two successive inventories; the first representing 1976 conditions, the second 1985 conditions. The logic behind Connaughton and Campbell's model is to think of a private forest landowner viewing a stand in 1976 where the stand's growing stock volume is known. The 1976 to 1985 compound growth rate becomes a surrogate for the owner's anticipated growth rate for the stand over the next 10 years.

Since the model was actually estimated for a 9 year interval (1976-1984), the estimated probability of stand harvest represents the likelihood that the owner would harvest the stand sometime during the interval. Given that the plot represents numerous like stands; the estimated probability can be thought of the proportion of area represented by the plot that would actually be harvested within the next 9 years[4]. For each subregion, the total private harvest was computed as:

$$\text{Total Private Harvest} = {-}_{k} (P_k V_k A_k) \qquad (1)$$

where:

P_k is the estimated probability of stand harvest (a value between 0 and 1 inclusive) for the subregion's kth plot.

V_k is the volume per acre of material available for harvest for the subregion's kth plot.

A_k is the area expansion factor (acres) for the subregion's kth plot.

The private harvest was further distinguished by industrial versus non-industrial ownership.

In western Oregon, public timber supply levels are large enough that changes in offerings from National Forests or the BLM will influence stumpage price. Therefore, the estimated probabilities using the reported coefficients in Connaughton and Campbell's (1991) model imply private harvesting behavior consistent with the federal policies in effect over 1976-1984 period. Given that the model was to be applied using the 1990 growing stock and the anticipated growth rate for the 1991-2000 period[5], their reported model coefficients had to be adjusted to reflect changes in National Forest timber supply policies since the 1976-1984 period. The simplest approach was to adjust the intercept term in Connaughton and Campbell's model for assumed changes in the private harvest behavior under different federal timber supply policies. This was done by iteratively solving for the new intercept term value for Connaughton and Campbell's model such that the computed probabilities, when applied to the total private harvest formula in (1) for all subregions, would result in western Oregon's share of the TAMM private harvest for the federal policy under investigation.

For example, western Oregon's share of the TAMM projected private timber harvest for the Pacific Northwest - westside region under a federal timber supply policy reflecting new National Forest plans (*circa* 1990) and the BLM under current plans adopted in the 1980s[6] is 668 million cubic feet per year (mmcf/year). In contrast, directly applying the estimated coefficients in Connaughton and Campbell's (1991) model to the updated 1990 inventory resulted in an independent 1991-2000 private harvest projection for western Oregon of 663 mmcf/year. The 663 mmcf/year projection represents an extrapolation of the 1976-1984 private harvest behavior to the 1991-2000 period. The question then becomes: What intercept term in Connaughton and Campbell's probability of stand harvest model, when applied to the 1990 stand conditions, would give probabilities that result in a private harvest calculation from the formula in 1 equal to the TAMM derived western Oregon private harvest of 668 mmcf/year?

Figure 3 summarizes the results of the calibration procedures. The regional stumpage price serves as an indicator of the regional market equilibrium for the federal timber supply policy assumed in effect over the 1991-2000 period. In general, the private harvest does not vary too much as a result of significant price differences associated with the various federal timber supply policies represented. Therefore, only minor adjustments to the intercept term in Connaughton and Campbell's (1991) model were necessary for the private harvest disaggregation. The closeness of the Connaughton and Campbell, and the TAMM National Forest (before new plans), results in Figure 3 reflect that both projections assume a similar National Forest timber supply policy for the 1991-2000 period; namely timber sale offerings at the level existing over the 1976-1984 period.

Displaying the Timber Harvest by Ownership; 1991-2000

Five ownership groups were used to portray the timber harvest outlook, by subregion, for each BLM resource management plan theme considered: the BLM, National Forests, other public, non-industrial private, and industrial private. For all BLM alternatives, the National Forest harvest levels were held constant at the allowable sale quantity for the preferred alternative in the Final Environmental Impact Statement for the northern spotted owl (Table IV-N-4). National Forest and BLM allowable sale quantities were pro-rationed to western Oregon subregions using the administrative area harvest pro-rationing factors used in Greber and others (1990). The other public harvest was also held constant at the observed 1984-1988 annual average for all BLM resource management plan alternatives.

Changes in the harvest by BLM resource management plan theme were due to differing BLM allowable sale quantities across alternatives, and the unique private harvest response to each BLM resource management plan theme considered. As discussed above, the private harvest disaggregation, by subregion, was based on a 10 year accumulation of the annual TAMM projections over the 1991-2000 period and then converted to an annual harvest rate for the period. While only labelled as occurring over the 1993-2000 period, the annual private harvest actually reflects the 1991-2000 rate of harvest which included 2 years (1991 and 1992) of same BLM harvest quantity for all BLM alternatives considered since plan implementation was assumed to commence in 1993.

Reapportioning the Harvest into Log Consumption; 1991-2000

The consumption of harvested timber by processing facilities within western Oregon was calculated using an average of the 1982 log flow information reported in Howard (1984a) and the 1988 log flow information reported in Howard and Ward (1991a). These two years contrasted periods of differing economic activity; the recession in 1982 and the recovery in 1988. Both the 1982 and 1988 log flows were adjusted for the amount of western Oregon timber processed out-of-state using Howard (1984b), Howard and Ward (1991b), Larsen

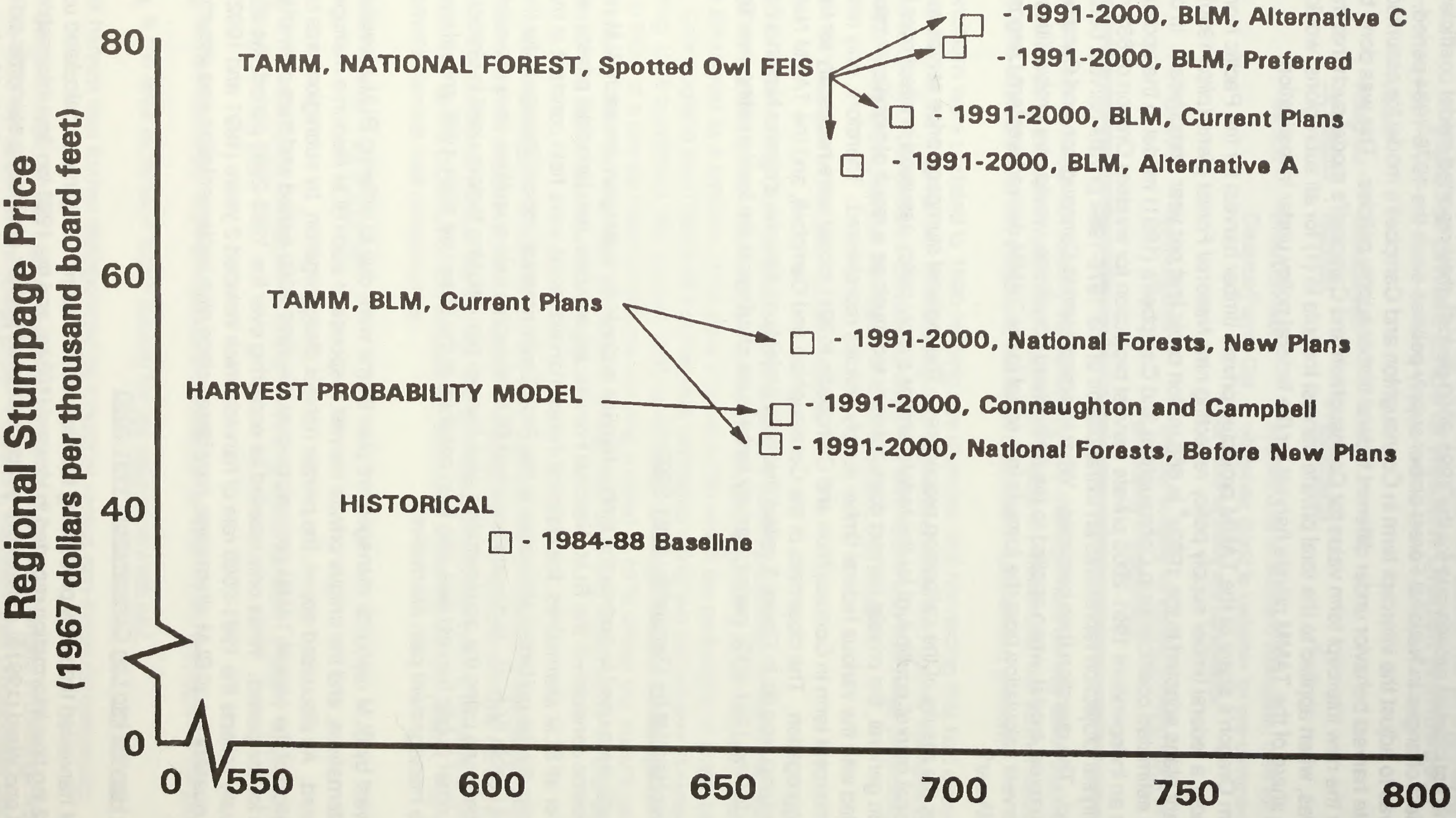

Figure 3. Private harvest calibration for changes in federal timber policy.

Table IV-N-4. USDA Forest Service Allowable Sale Quantities

National Forests	Allowable Sale Quantity (million cubic feet per year)
Mt. Hood	20.1
Rogue River	9.3
Siskiyou	22.6
Siuslaw	32.6
Umpqua	46.6
Willamette	48.7
Total	179.9

Cubic foot equivalents to the board foot allowable sale quantities under the Interagency Scientific Committee's conservation strategy for the northern spotted owl as reported in U. S. Department of Agriculture (1992a). Source: USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

and others (1983) and Larsen 1992). The data was expressed as fractions representing the proportion of timber harvested in one subregion processed in other subregions (including itself).

Log consumption was calculated as follows:

$$q = h\_LOGFLOW. \qquad (2)$$

where:

q denotes a vector of log consumption, where q_i represents the amount of log consumption by processing facilities located in subregion i.

LOGFLOW denotes a matrix of log flow proportions containing elements $-_{ij}$ representing the proportion of timber harvested within subregion i processed in subregion j; where $-_{j}-_{ij} = 1$.

h denotes a vector of timber harvest, where h_i represents the total harvest from all ownerships in subregion i.

Updating the Private Inventory; Harvest and Log Consumption 2001-2010

Acres harvested for regeneration over the 1991-2000 period were removed from the inventory and unavailable for harvest during the 2001-2010 period. Thinned acres, plus non-harvested acres not scheduled for thinning, became the acres available for harvest over the 2001-2010 period. These acres were paired with year-end 2000 yields, mid-period 2005 harvest and thinning yields (if appropriate), and year-end 2010 yields (in the absence of thinning) for application of the Connaughton and Campbell (1991) probability of stand harvest model over the 2001-2010 period.

No further adjustments to the intercept term in Connaughton and Campbell's model were made for the 2001-2010 harvest projections. The rationale was a continuation of the resource management plans assumed implemented during the 1991-2000 period. Holding the intercept term constant indicated no further change in private harvesting behavior. What did change though was the available private harvest inventory that this behavior would apply to. That is, given the change in the composition of the private inventory resulting from growth and harvest removals over the 1991-2000 period, what quantity of private harvest would occur over the 2001-2010 period using the same intercept term in Connaughton and Campbell's model used in the 1991-

2000 harvest projection? Differences in the private harvest projections for the 2001-2010 period, when compared to the 1991-2000 period, reflected harvest increases (or decreases) associated with the characteristics of the year-end 2000 inventory when compared to the year-end 1990 inventory.

The procedures used to display the timber harvest and log consumption for the 1991-2000 period were the same ones used for the 2000-2010 period. The harvest quantities for the BLM, National Forests, and other public ownerships were the same as reported for the 1991-2000 period. Therefore, the aggregate annual harvest total for 2001-2010, when compared to the 1991-2000 annual total, solely reflected differences in the private harvest.

What About the Klamath Resource Area of the Lakeview District?

The Bureau of Land Management's Klamath Resource Area administered by the Lakeview District is located outside boundaries used for this analysis. Therefore, private harvest responses to differing BLM allowable sale quantities by resource management plan alternative in the vicinity of the Klamath Resource Area (Klamath County) were not provided by this analysis. However, some effects attributable to the Klamath Resource Area were still captured by the analysis.

The TAMM regional market equilibriums did include the Klamath Resource Area allowable sale quantities as BLM harvest volume originating within the Pacific Northwest - westside region; though technically the Klamath Resource Area is located on the eastern slope of the Cascade Range. This is reasonable since there is observed log flow from Klamath County into western Oregon counties. From a regional perspective it made more sense to lump the Klamath Resource Area as part of the total BLM effect on the Pacific Northwest - westside region rather than splinter out its small allowable sale quantity and model its regional impact on TAMM's Pacific Northwest eastern supply region. Finally, how differing allowable sale quantities by resource management plan alternative on the Klamath Resource Area effected western Oregon log consumption was provided by the analysis.

RESULTS AND DISCUSSION

Table IV-N-5 summarizes the private harvest disaggregation for the 1991-2000 period and subsequent projections for the 2001-2010 period. Furthermore, Table 5 compares these results to the 1984-1988 historical baseline, as well as earlier timber availability projections contained in Sessions (1990). There is little response in the western Oregon private harvest across BLM resource management plan themes since the stumpage price - private harvest response relationship in TAMM is inelastic (see Table 2 and Figure 3). For western Oregon as a whole, the private harvest projections vary across BLM resource management plan themes by 15-20 million cubic feet per year (Table IV-N-5). This variation is even narrower (8-10 million cubic feet per year) for the 2001-2010 period.

When compared to the 1984-1988 baseline period, the 1991-2000 private harvest disaggregation, regardless of BLM resource management plan theme, exceed the 1984-1988 baseline harvest by 100 million cubic feet per year. The increase during the 1991-2000 period reflects a private harvest response to the regional stumpage price increase that occurred between the 1984-1988 period and the 1991-2000 projection period (Table IV-N-2) as a result of the reduced timber supply offerings on National Forest lands. Furthermore, these harvest increases can be attributed to increases on the non-industrial private ownership since the 1991-2000 harvest disaggregation of the industrial ownership is lower than the 1984-1988 historical baseline (Table 5). The proportion of private timberland harvested over the 1991-2000 period to the total private timberland acreage available at the end of 1990, ranged from 13 to 18 percent across subregions (higher percentages to the north) and was not substantially affected by the BLM resource management plan theme being considered. Thinned acres represented 2 to 9 percent of the area of private timberland existing in 1990.

Comparison of the 2001-2010 projections with the 1991-2000 harvest disaggregation shows a dramatic increase in the total private harvest, roughly 100 million cubic feet per year (Table IV-N-5). This holds for all subregions except the South Coast and Medford. The increase reflects that young, fast-growing stands, not harvested over the 1991-2000 period become attractive for harvest (in the context of the landowner behavior in Connaughton and Campbell's (1991) probability of stand harvest model) in the 2001-2010 period. One important qualification for this harvest gain is that pre-1990 forest practice rules and related environmental

Table IV-N-5. Results for the 1993-2000 private harvest disaggregation and 2001-2010 projection by BLM resource management plan theme

	Private Harvest, Western Oregon (million cubic feet per year)					
BLM Resource Management Plan Theme	1993-2000			2001-2010		
	IND	NIPF	TOTAL	IND	NIPF	TOTAL
Preferred Alternative (BLM ASQ = 96)	507	193	700	580	226	806
Current Plans (BLM ASQ = 190)	499	190	689	576	223	799
Alternative A (BLM ASQ = 251)	492	187	679	574	220	794
Alternative B (BLM ASQ = 227)	495	187	682	574	223	797
Alternative C (BLM ASQ = 68)	510	194	704	581	226	807
Alternative D (BLM ASQ = 76)	509	194	703	581	226	807
Alternative E (BLM ASQ = 56)	511	195	706	582	226	808
Timber Availability[1] (BLM ASQ = 190)	544	125	669	557	125	682
	IND	NIPF	TOTAL			
1984-1988 Baseline (BLM Harvest = 202)	525	77	602			

Notes:

IND	-	Private industrial ownership.
NIPF	-	Private non-industrial ownership.
BLM ASQ	-	Bureau of Land Management resource management plans cumulative allowable sale quantity for western Oregon (million cubic feet per year). Includes the Klamath Resource Area of the Lakeview District.
BLM Harvest	-	Bureau of Land Management actual harvest (million cubic feet per year).

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[1] Sessions (1990).

constraints on the private timberlands remain unchanged through 2010. The proportion of private timberland harvested over the 2001-2010 period to the total private timberland acreage available at the end of 2000, ranged from 15 to 23 percent across subregions (higher percentage to the north). The proportion of private timberland area thinned ranged from 4 to 10 percent of the total private timberland acreage not harvested by 2000.

The timber availability projections in Sessions (1990), which contained no mechanism for adjusting private harvest quantities to stumpage prices, would underestimate the private harvest disaggregation for the 1991-2000 period. In addition, the Sessions' private harvest projections for periods subsequent to the year 2000 were constrained by an even flow condition. In contrast, the 2001-2010 harvest projections from this analysis reflect the flexibility of the private ownership to harvest within all available merchantable age classes without any restrictions regarding even flow. In all likelihood, the 2001-2010 harvest quantities in this analysis would exceed the Sessions' even flow requirement.

Table 6 summarizes the log consumption results by BLM resource management plan theme for the 1993-2000 and 2001-2010 reporting periods. For comparison purposes, the total western Oregon harvest from all ownerships is shown. Western Oregon was a net importer of logs over the 1984-1988 period as total consumption exceeds harvest (Table IV-N-6). This pattern was not allowed to vary in this analysis. Since log consumption was a reapportioning of the timber harvest to where the volume is consumed, differences across BLM resource management plan alternatives were minor and reflected the inelastic private timber harvest response to the different BLM allowable sale quantities.

For all BLM resource management plan themes, log consumption in western Oregon is projected to decrease when compared to the 1984-1988 baseline period. Most of this decrease is from reduced National Forest allowable timber sale quantities. The loss in consumption would have been greater had it not been for harvest increases on private lands; especially the non-industrial ownership (Table IV-N-5). By the 2001-2010 period, further increases in both the industrial and non-industrial private harvest brings consumption close to historical levels. In addition, implementing alternatives A or B on all BLM administered lands in western Oregon would provide enough harvest to restore consumption to the 1984-88 historical level (Table IV-N-6).

TERMINOLOGY

Allowable Sale Quantity — Planned timber sale offerings from federal lands. For the USDA Forest Service, refers to offered quantities of sawtimber convertible to lumber or plywood. For the BLM, includes sawtimber and a small component of sound chippable material.

Analysis Period — Computation periods for the analysis. Period 1 covers the period of plan implementation (1991-2000) and period 2 covers the first period thereafter (2001-2010). Results for the 1991-2000 period are converted to an annual basis and reported for the 1993-2000 period since BLM resource management plan implementation was assumed to commence in 1993.

Baseline Period — Historical period used as a reference point for comparison of projected harvests. The period chosen by the BLM was the 1984-1988 period (U. S. Department of the Interior 1988).

BLM — U. S. Department of the Interior, Bureau of Land Management, Districts of western Oregon: Coos Bay, Eugene, Medford, Roseburg, Salem, and the Klamath Falls Resource Area of the Lakeview District.

Commercial Thinning — Removal of industrial crop trees to reduce competition among remaining trees in the stand, and thereby increase growth and yield of remaining trees. For purposes of growth and yield projections, assumed to occur during the fourth decade of stand development on slopes less than 35% slope (40-45% in the Medford subregion). Minimum volume and basal area restrictions were also applied in the Medford subregion to more realistically portray commercial thinning.

Fertilization — Application of nitrogen fertilizer to forest land to increase the rate of tree growth. For the projection of growth and yield, fertilization was assumed to be applied at a rate of 200 lbs/acre for eligible plots. Eligible plots were those of medium site productivity on the industrial ownership in all subregions except Medford. Application was assumed to occur during the third decade of stand development when preceding

Table IV-N-6. Log consumption results by BLM resource management plan theme

Log Consumption by Western Oregon Processing Facilities
(million cubic feet per year)

BLM Resource Management Plan Theme	1993-2000				2001-2010			
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP
Preferred Alternative	1,034	990	169	1,159	1,139	1,086	169	1,255
Current Plans	1,114	1,069	172	1,241	1,225	1,170	172	1,342
Alternative A	1,166	1,118	171	1,289	1,281	1,224	171	1,395
Alternative B	1,144	1,098	171	1,269	1,258	1,203	170	1,373
Alternative C	1,009	966	169	1,135	1,113	1,061	168	1,229
Alternative D	1,015	972	170	1,142	1,120	1,067	170	1,237
Alternative E	1,000	956	168	1,124	1,102	1,050	168	1,218

	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP
1984-1988 Baseline	1,248	1,196	172	1,368

Notes:

HARV - Total harvest from all ownerships within western Oregon (million cubic feet per year).

END CNSMP - Consumption of logs originating from ownerships within western Oregon (million cubic feet per year). The difference between HARV and END CNSMP represents the volume of timber originating in western Oregon, but processed by out-of-state or eastern Oregon mills.

EXOG CNSMP - Consumption of logs originating from ownerships from eastern Oregon and out-of-state (million cubic feet per year). Differences reflect the effect of implementing different BLM resource management plan alternatives on Klamath Resource Area of the Lakeview District in eastern Oregon.

TOTAL CNSMP - Total log consumption (all origins) by western Oregon processing facilities (million cubic feet per year).

commercial thinning, and the fifth decade of stand development when preceding clearcut.

Log consumption — Volume of timber processed by manufacturing and export facilities throughout western Oregon. Calculated as a reapportioning of the western Oregon timber harvest using log flow information in Howard (1984a) and Howard and Ward (1991a). Also includes timber processed from eastern Oregon and out-of-state origins. Manufacturing includes primary end-uses such as lumber, plywood, and other products using sound chippable material. Includes logs exported to foreign destinations from western Oregon ports.

National Forests — Western Oregon National Forests of the USDA Forest Service Pacific Northwest Region: Mt. Hood, Rogue River, Siskiyou, Siuslaw, Umpqua, and Willamette.

Ownership, Owner Groups — See definition of timber harvest below.

Pacific Northwest - Westside (PNWW) Region — That portion of Oregon and Washington west of the Cascade Range divide.

Precommercial Thinning — Removal of young trees with no commercial value to provide growing space for future crop trees. For the projection of growth and yield, pre-commercial thinning was assumed to occur early in second decade of stand development when 60% or more of the plot's points had a stocking of more than 350 conifers per acre; lower stocking levels were permissible for the Medford subregion. Approximately 275 trees per acre were projected to remain after pre-commercial thinning.

Private Timberland — Private forestland capable of producing 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Probability of Stand Harvest — Refers to the likelihood that a inventory plot (representing a stand), given its growing stock volume of harvestable material and anticipate growth, will be harvested within a 10 year period. These probabilities were estimated by adjusting Connaughton and Campbell's (1991) probability of stand harvest model for different federal timber supply policies. Each probability represents the proportion of plot's area expansion harvested over the 10 year period.

Regional Market Equilibrium - A balance between the quantity of timber supplied with the quantity of timber demanded (including volume exported for out-of-region consumption) for the Pacific Northwest - westside region. The quantity of timber supplied is reported as timber harvest, while the quantity of timber demanded is reported as log consumption.

Regional Stumpage Price — The market clearing regional stumpage price (in 1967 dollars per thousand board feet) that balances timber supply and demand for the Pacific Northwest - westside region. The average value of all species of timber harvested from USDA Forest Service National Forest lands in the Pacific Northwest - westside region was used as a proxy for the regional stumpage price. See Warren 1992; deflated to 1967 dollars per thousand board feet, Scribner. using the producer price index, all commodities (1967=100) reported in Ulrich (1988) and (1990).

Resource Management Plan Theme — Refers to the implementation of similar resource management plan alternatives on all BLM administered lands in western Oregon. The themes correspond to Alternatives A-E, current plans, and the Preferred alternative.

Stand Conditions — Refers to the per acre quantity (million cubic feet) of harvestable material on an inventory plot, or stand represented by an inventory plot. Also includes the compound rate growth over a specified 10 year period.

Subregion — Geographically defined reporting areas for timber supply and log consumption. They are defined to closely approximate the local areas proximate to BLM District boundaries. See Figure 1 and Table 1.

Timber Assessment Market Model (TAMM) — A supply and demand equilibrium model that provides 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector (see Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990).

Timber Demand — An inverse stumpage price - quantity relationship for logs. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category. This analysis accounts for timber demand in the regional market equilibriums calculated using the Timber Assessment Market Model.

Timber Harvest — Timber harvest is distinct from timber supply in that harvest represents tree volume removed from growing stock inventory and converted into primary end uses such as lumber, plywood, and other products using sound chippable material. Reported on an annual basis. Definitions by ownership groups are as follows:

Source of Change

BLM - USDI Bureau of Land Management planned 10 year allowable sale quantity for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts; and the Klamath Resource Area of the Lakeview District. Varies by resource management plan theme. Includes sawtimber and sound chippable material.

Estimated by the Analysis

Industrial - Ownership class of private lands owned by companies or individuals operating wood using plants. Also includes large corporate owners who manage lands for timber production but do not own or operate wood using plants. Harvest refers to net merchantable growing stock removals.

Non-Industrial Private - Ownership of private lands that does not meet the industrial classification. Includes small woodland owners and farmers. Harvest refers to net merchantable growing stock removals.

Held Constant Across all BLM Resource Management Plan Themes

National Forest - USDA Forest Service planned 10 year allowable sale quantity for Oregon National Forests west of the Cascade Range Divide (see Table 4). This quantity only includes sawtimber material suitable for lumber or plywood manufacture.

Other Public - Observed 1984-1988 timber harvest from local, state, and federal (excluding BLM and National Forest) timberlands.

Timber Supply — Timber supply is a schedule of what quantity of trees may be removed given ownership policies, available inventory, and stumpage price. Timber harvest is an observable consequence of timber supply. Public forest owners were assumed to have an inelastic timber supply schedule not responsive to stumpage price.

USDA Forest Service — U. S. Department of Agriculture, Forest Service.

Supporting Data

Actual 1991 and 1992 BLM Harvest — Used to initialize the TAMM projections for the actual level of BLM timber harvest for the first two years of the 1991-2000 analysis period. The 1992 harvest is an extrapolation of the observed harvest through March 1992. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

BLM Allowable Sale Quantities — Planned allowable sale quantities by western Oregon District for each resource management plan theme. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

BLM Chip Proportions — Proportion of BLM allowable sale quantity in sound chippable material. Used to convert reported BLM allowable sale quantities into sawtimber component since it is the sawtimber component that is necessary for input into TAMM. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

Exogenous Consumption — Logflow from the following county origins and processed within western Oregon subregions were held constant throughout the analysis: 1) Klamath county origin, 2) Other eastern Oregon counties, and 3) Out-of-State county origin. Annual volumes were the average of the 1982 and 1988 reported log flows from these origins into western Oregon. ***Source:*** Howard 1984a, Howard and Franklin 1991a.

Log Flows — Used to calculate log flow proportions used in log consumption calculations. ***Source:*** Larsen and others (1983), Howard (1984a), Howard (1984b), Howard and Ward (1991a), Howard and Ward (1991b), and Larsen (1992).

National Forest Allowable Sale Quantities — USDA Forest Service planned 10 year allowable sale quantity in million cubic feet per year. This quantity only includes sawtimber material suitable for lumber or plywood manufacture. This sale quantity assumes implementation of the Interagency Scientific Committee's conservation strategy for the northern spotted owl as indicated in the Final Environmental Impact Statement for the northern spotted owl (U. S. Department of Agriculture 1992a and 1992b). See Table IV-N-4. ***Source:*** USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

National Forest and BLM District Administrative Area Harvest Pro-rationing Factors — Represents the proportion of allowable sale quantity from an administrative unit (e.g., National Forest, BLM District) occurring within the boundaries of a particular subregion. ***Source:*** Adapted from supplemental information used in Greber and others (1990).

Other Public Harvest — Annual average for the 1984-1988 period as reported in the Oregon timber harvest reports (Oregon Forestry [1986], Oregon State Department of Forestry [1985, 1987], Oregon State Forestry Dept. [1988, 1989]). Converted to million cubic feet per year.

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[1] Definitions for terms such as regional stumpage price can be found in the terminology section following the main text.

[2] Actual data was complete through the end of 1990. Analysis results covering the 1991-2000 period were converted to an annual basis and reported for the 1993-2000 period since the BLM resource management plan implementation was assumed not to commence prior to 1993.

[3] Other harvest sources are from forestland conversions to other uses and dead and down large material.

[4] In application, the 9 year area proportions were extrapolated to reflect harvested acreage over a 10 year period.

[5] The anticipated growth rate was calculated as the compound growth rate bringing the 1990 stand growing stock volume to its year-end 2000 counterpart in the absence of any scheduled thinning. The rationale applied here was that the owner's anticipated growth rate, for the purposes of identifying candidate stands for final harvest, would not be based on the stand being thinned over the period as well.

[6] Timber Assessment Market Model (TAMM90), log run 529.

Appendix IV-O

Consistency of the Proposed Action and Alternatives with State of Oregon Wildlife Plans

State Plan/Statute	Objective	Consistency of Alternatives
Oregon Statutory Wildlife Policy, Revised Statute 496.012	Maintain all species of wildlife at optimum levels and prevent the serious depletion of any indigenous species.	Alternatives NA, A, and B could lead to substantial depletion of those populations of species heavily dependent on older forest habitat, that occupy BLM-administered lands in the planning area. (See following discussions of threatened and endangered species and sensitive species). Several alternatives may maintain other populations at less than optimum (see later discussion of big game management objectives.
	Develop and manage the lands and waters of the state in a manner that will enhance the production and public enjoyment of wildlife.	
	Develop and maintain public access to the lands and waters of the state and the wildlife resources thereon.	Public access would be greatest in Alternatives NA, A, and B and more limited by road closures to public vehicular use in Alternatives C, D, E, and the PA.
		Regulate wildlife populations and public enjoyment of wildlife in a manner that is compatible with primary uses of the lands and waters of the state and provide optimum public recreational benefits.
Oregon Threatened and Endangered Species Act	Protect and conserve wildlife species that are determined to be threatened or endangered.	All State listed species, except the western snowy plover, found within the Coos Bay District are also federally listed under the Endangered Species Act. As such, those species would be protected under the requirements and provisions of the Act. The snowy plover would be protected under all alternatives. See Chapter 4, Special Status Species for a more complete discussion.

State Plan/Statute	Objective	Consistency of Alternatives
Oregon's Sensitive Species Rule	Help prevent species from qualifying for listing as threatened or endangered.	Most species on Oregon's sensitive species list would be well protected under Alternatives C, D, E, and the PA, but many would not be well protected under Alternatives A and B. Of the "critical" species on Oregon's sensitive list, noteworthy exceptions are the marbled murrelet which would be well protected only under Alternative C, D, E, and the PA. Also see later discussions of wild fish policy and fish plans.
Nongame Wildlife Plan	Maintain populations of naturally occurring Oregon nongame wildlife at self-sustaining levels within natural geographic ranges in a manner which provides for optimum recreational, scientific and cultural benefits, and where possible, is consistent with primary uses of lands and waters of the state.	See preceding discussions.
Big Game Population Management Objectives	Develop, restore and/or maintain big game (along with associated recreational, aesthetic and commercial opportunities and benefits) at the level identified in 1980 as the planning target level by game management unit. This is accomplished through hunting season regulation and implementation of multiple-use management practices on public lands that tend to stabilize the cover-forage relationship in space and time, provide for a wildlife emphasis in management of sensitive wintering areas, and offer habitat improvement opportunities.	Under Alternatives A and B, cover on BLM-administered lands would decline, while under Alternatives C, D, E, and portions of the PA forage on BLM-administered lands would decline. In the latter case, however, private lands are expected to provide adequate forage, except possibly in one management area (dominated by Federal public lands) in an Alternative D critical habitat area. All alternatives provide for forage seeding. Road closures in Alternatives C, D, E, and the PA would improve habitat for elk.

State Plan/Statute	Objective	Consistency of Alternatives
Wild Fish Policy	Protect and enhance wild stocks.	With the exception of Alternatives NA, A, and B no alternative would change habitat conditions enough in the short term on many already designated streams to protect existing stocks with certainty. In the long term, all alternatives would protect streams sufficiently to protect wild stocks and all but Alternatives NA, A, and B would provide sufficient stream habitat protection to contribute to their enhancement.
Coho, Steelhead and Trout Plans	Maintain and enhance production.	Similar to wild stocks. See preceding.
Basin Fish Management Plans	Establish compatible objectives for management of all fish stocks in each basin. Present tasks for attaining objectives, describe unacceptable management strategies and set priorities on achievement.	Similar to wild stocks. See preceding. Unacceptable management strategies defined mostly by omission.
Oregon Forest Practices Act Rules	Establish minimum standards which encourage and enhance the growing and harvesting of trees while considering and protecting other environmental resources such as air, water, soil and wildlife.	See Appendix IV-P, item 2.

Appendix IV-P

Consistency of the Plan Alternatives with the Forestry Program for Oregon (FPFO)

FPFO Objective	Consistency of Alternatives
1. **Forest Land Use**. Preserve the forest land base of Oregon: Stabilize the present commercial forest land base. Manage habitat based on sound research data and the recognition that forests are dynamic and most forest uses are compatible over time.	All alternatives preserve most of the forest land administered by BLM, while allowing for some conversion of forest to accommodate expansion of transportation, power and communication facilities. All alternatives also allow for exchange and/or sale of some forest lands, which could lead to their conversion to nonforest uses if local land-use plans permit. Land that would be managed for commercial forest products ranges from a high of 265,000 acres under Alternative A to a low of 108,700 acres under Alternative E. Only Alternatives NA and A maintain at least the 247,600 acres currently allocated to commercial forest production. Alternatives C, D, and E allocate substantial acreage to management of habitats to the exclusion of timber production. The allocation of such land in Alternative D is most explicitly based on current research data. Alternatives NA, B, and C place varying stress on compatibility of forest uses.
2. **Forest Practices**. Assure practical forest practices that conserve and protect soil productivity and air and water quality: Promote forest practices that maintain Oregon's forest values, including forest tree species, fish and wildlife, soil productivity, and air and water quality. The Forest Practices Act and rules are one vehicle for accomplishing this.	All alternatives provide for the use of practical forest practices that meet this goal and, with some exceptions, meet or exceed the requirements of the Oregon Forest Practices Act and rules of the Oregon Smoke Management Plan. Specific exceptions are: (1) possible inconsistency of Alternatives NA, A, and B with the clearcut proximity requirement of Section 4 of the Act as revised in 1991; inconsistency of Alternative A with the snag/wildlife tree retention requirement and the scenic highway visual protection requirement of revised Section 5 of the Act; possible inconsistency of Alternatives NA, A, B, and C with the rule requiring maintenance of 70 acres of suitable habitat encompassing each spotted owl nest site, and inconsistency of all alternatives except E with the 1991 interim rule regarding protection of intermittent streams that have a direct confluence with a Class I stream. Since the 1991 interim rules are scheduled to be superseded by new rules by September 1, 1992, the preferred alternative for the proposed RMP/final EIS can be conformed to those new rules.
3. **Timber Growth and Harvest.** Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and taking into consideration landowner objectives.	Each alternative provides for the use of intensive forest management practices that are professionally and environmentally sound, to promote timber growth and harvest on all forest lands allocated as available for such intensive management, consistent with the alternatives' goals and objectives. Each alternative considers the application of such practices, even where they may be uneconomic, for the potential purpose of promoting timber growth and harvest.
4. **Recreation, Fish and Wildlife, Grazing and Other Forest Uses**. Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation and scenic values on all forest lands, consistent with landowner objectives: A full range of recreation opportunities is encouraged. Where needed to reduce harassment and/or over harvest of wildlife, road closure programs are supported.	Each alternative provides opportunities for other forest uses, consistent with the alternatives' goals and objectives. Although all alternatives provide a full range of recreational opportunities, the emphasis of the alternatives varies. Alternative A limits the number of developed recreation sites maintained. Alternatives D and E emphasize nonmotorized recreation opportunities. Road closures to protect wildlife habitat and other values are emphasized in Alternatives C, D, E, and the PA.

5. **Forest Protection.** Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects, disease and other damaging agents: Use integrated pest management. Minimize total cost plus loss resulting from wildfire. Employ cost-effective fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the state's forest fire protection program.

Under all alternatives, economically efficient protection strategies would be employed, and integrated pest management would be used. Minimizing total cost plus loss from wildfire would be integral. Planned-ignition prescribed fires would be emphasized over natural-ignition prescribed fires, but the latter could be used to achieve resource and fire management objectives. Cooperation with other fire suppression agencies, including state and local agencies, would help assure cost-effective fire protection and suppression by all parties. Alternatives D and E would provide less efficient protection from wildfire than the other alternatives, however, as their lower intensity of timber management in rural interface areas would increase both the risk of wildfire and the cost of suppression.

Appendix IV-Q

Relationship of Alternatives to Statewide Planning Goals

Statewide Goal Number and Description	Consistency of Alternatives
1. Citizen Involvement - To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process. Federal and other agencies shall coordinate their planning efforts with the affected government bodies and make use of existing local citizen involvement programs established by cities and counties.	BLM's land use planning process provides for public input at various stages. Public input was specifically requested in developing issues, planning criteria, and the preferred alternative. Public input will continue to be utilized in development of the final RMP. Coordination with affected government bodies, including the Governor's forest planning team, has also been ongoing and will continue. BLM has used county planning departments to provide linkage to local citizen involvement programs.
2. Land Use Planning - To establish a land use process and policy framework as a basis for all decisions related to use of land and to assure an adequate factual base for such decisions and actions.	The preferred alternative and other alternatives have been developed in accordance with the land use planning process authorized by the Federal Land Policy and Management Act of 1976 which provides a policy framework for all decisions and actions. The process includes issue identification, inventories, and evaluation of alternative choices of action. Intergovernmental coordination in the planning process is discussed in Chapter 5 of the RMP/EIS.
3. Agricultural Lands - To preserve and maintain existing commercial agricultural lands for farm use, consistent with existing and future needs for agricultural products, forest and open space.	None of the alternatives exclude BLM-administered grazing land from grazing use or affect the use of other lands for agriculture use.
4. Forest Lands - To conserve forest lands for forest uses. Growing and harvesting of forest tree species is the leading use of forest land consistent with the sound management of soil, air, water, and fish and wildlife resources, and provision for recreational opportunities and agriculture.	BLM-administered lands in the planning area are predominately forest land and woodlands. None of the alternatives would lead to substantial conversion of those lands to nonforest uses. Conversion areas such as new forest roads and utility rights-of-way would be limited to the minimum width necessary for management and safety, and the latter limited to existing corridors where practical. All alternatives are consistent with the state's forest land protection policies.

5. Open Spaces, Scenic and Historic Areas, and Natural Resources - To conserve open space and protect natural and scenic resources.

Programs shall be provided that will (1) ensure open space, (2) protect scenic and historic areas and natural resources for future generations, and (3) promote healthy and visually attractive environments in harmony with the natural landscape character. The location, quality and quantity of the following resources shall be inventoried;

   a. Land needed or desirable for open space
   b. Mineral and aggregate resources
   c. Energy sources
   d. Fish and wildlife areas and habitats
   e. Ecologically and scientifically significant natural areas, including desert areas
   f. Outstanding scenic views and sites
   g. Water areas, wetlands, watersheds and groundwater resources
   h. Wilderness areas
   i. Historic areas, sites, structures and objects
   j. Cultural areas
   k. Potential and approved Oregon recreation trails
   l. Potential and approved federal wild and scenic waterways and state scenic waterways

Where no conflicting uses for such resources have been identified, such resources shall be managed so as to preserve their original character. Where conflicting uses have been identified, the economic, social, environmental and energy consequences of the conflicting uses shall be determined and programs developed to achieve the goal.

Based on the analyses of economic, social, environmental, and energy consequences to Goal 5 resources listed above, conflicting uses of (BLM managed) lands and resources may be resolved by selection of three management options: (1) protect the resource site, (2) allow conflicting uses fully, or (3) limit conflicting uses. This is achieved by designating with certainty what uses and activities are allowed fully, what uses and activities are not allowed at all, which uses are allowed conditionally, and what specific standards or limitations are placed on the permitted and conditional uses and activities for each resource site.

Natural, historic, and visual resources were considered in the development of the alternatives. Availability of mineral, aggregate, and energy sources would be greatest under the Alternatives NA, A, and B. Timber management under the alternatives would impact natural and visual resources. Adverse impacts to visual resources, wildlife habitat, potential wild and scenic rivers and state waterways, and unique natural areas would be greatest under Alternatives NA, A, and B, and least under Alternative E. Water areas, wetlands, and watersheds would be protected under all alternatives, with the greatest protection under Alternatives D and E. See Chapter 4 for discussions. Also see Appendix IV-P for discussion of consistency with relevant sections of the Forest Practices Act and Rules. The PA attempts to balance conflicting uses in light of their consequences.

Under Alternatives NA, A, and B conflicting resource uses are generally resolved by allowing the (non-Goal 5) uses fully with minimal limitations to meet economic and certain social needs, except where clearly prohibited by federal or state law, in which case the non-Goal 5 use is limited to the extent necessary. Under Alternatives D and E, conflicting resource uses are almost always resolved by protecting the (Goal 5) resource site or severely limiting conflicting uses to meet environmental and other social goals. Partial protection of (Goal 5) resources is most obvious in Alternative C and the PA.

Even without any tradeoffs to enhance or maintain the existing commercial forest program, tradeoffs are necessary between Goal 5 resource values. For example, mineral and aggregate resource or energy source access and development frequently conflict with all other Goal 5 values, and strict guidelines for the management of designated or potential wilderness or federal wild rivers may virtually preclude development or active management to benefit other Goal 5 resource values.

6. Air, Water, and Land Resources Quality - To maintain and improve the quality of the air, water, and land resources of the state.

The Federal and state water quality standards would be met, and water quality would be maintained and/or improved under all alternatives. See Chapter 4, Effects on Water Resources, for discussion. Burning of logging slash under all alternatives would have a slight temporary effect on air quality at upper atmospheric levels. All alternatives would comply with the statewide Smoke Management Plan and the State Implementation Plan. See Chapter 4, Effects on Air Quality, for discussion. Also see Appendix IV-P for discussion of consistency with relevant sections of the Forest Practices Act and rules.

8. Recreational Needs - To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts. Federal agency recreation plans shall be coordinated with local and regional recreational needs and plans.	The BLM actively coordinates its outdoor recreation and land use planning efforts with those of other agencies to establish integrated management objectives on a regional basis. Under all alternatives opportunities would be provided to meet recreation demand (identified in Oregon's SCORP). Projected demand for activities on BLM-administered land would be met with the following exceptions: Alternatives D and E would not meet demand for off-road vehicle use; Alternatives NA, A, and B would not meet demand for nonmotorized travel; and Alternatives NA, A, B, and C would not meet demand for camping; Alternatives NA, A, and B would not meet the demand for picnicking, studying nature, viewing wildlife; Alternatives NA, A, B, and C would not meet the demand for boating; and Alternatives A and B would not meet the demand for swimming, windsurfing, and general waterplay. See Chapter 4, Effects on Recreation, for further discussion. There has been no specific interest in development of destination resort sites on BLM-administered lands.
9. Economy of the State - To diversity and improve the economy of the state.	Alternatives NA, A, and B would contribute to economic stability by supporting BLM-resource-dependent employment and payments to counties at levels near or above those of recent years. Alternatives C, D, E, and the PA would support lower levels of such employment and payments to counties due to diminished timber production. Employment in rural areas would be most affected. See Chapter 4, Effects on Socioeconomic Conditions, for further discussion.
11. Public Facilities and Services - To plan, and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.	Under all alternatives, BLM-administered lands may be made available for development of public facilities or services by other parties, if the action would be permitted under the local government comprehensive plan and land use regulations, and relevant state siting requirements. Under Alternatives A and B, however, commercial timberland might not be made available for such uses.
12. Transportation - To provide and encourage a safe, convenient and economical transportation system.	All alternatives provide for accommodation of identified transportation needs, particularly for transportation of timber, but siting a major new transportation route (e.g., state highway) would require a plan amendment. Major utility corridors were considered and would be designated under all alternatives. The alternatives support state policy objectives to restrict use of BLM roads for access to non-resource development that would be inconsistent with state planning goals.

13. Energy Conservation - To conserve energy.	Conservation and efficient use of energy sources are objectives in all BLM activities. Although Alternatives C, D, and E propose inclusion of some additional rivers in the National Wild and Scenic River System, which would restrict the possibility of development of their hydroelectric potential, there are no pending development proposals and those rivers are considered to have low potential for such use. Firewood sales would be permitted under all alternatives, but under Alternatives C, D and E firewood availability would be limited by retention of wood onsite to provide wildlife habitat and help maintain soil productivity, and by allocation of substantial acreage to limited or no timber harvest.
16. Estuarine Resources - To recognize and protect the unique environmental, economic and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate, develop, and where appropriate, restore the long-term environmental, economic and social values, diversity and benefits of Oregon's estuaries.	No measurable impacts on estuarine resources from BLM-authorized activities are anticipated under any alternative.
17. Coastal Shorelands - To conserve, protect, where appropriate, develop and where appropriate, restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation and aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters; and to reduce the hazard to human life and property, and the adverse effects upon water quality and fish and wildlife habitat, resulting from the use and enjoyment of Oregon's coastal shorelands.	All alternatives would preserve and protect BLM-administered and other coastal shorelands delineated in acknowledged coastal city and county comprehensive plans and land use regulations. All but Alternatives NA, A, and B would limit vehicle use of shorelands to protect wildlife habitat and other values.
18. Beaches and Dunes - To conserve, protect, where appropriate, develop and where appropriate, restore the resources and benefits of coastal beach and dune area; and to reduce the hazard to human life and property from natural and man-induced actions associated with these areas.	No measurable impacts on beaches and dunes from BLM-administered activities are anticipated under any alternative.

Statewide goals 10, (Housing); 14, (Urbanization); 15, (Willamette River Greenway); and 19, (Ocean Resources) are not applicable.

Appendix IV-R

Western Oregon Northern Spotted Owl Hexagon Analysis Maps

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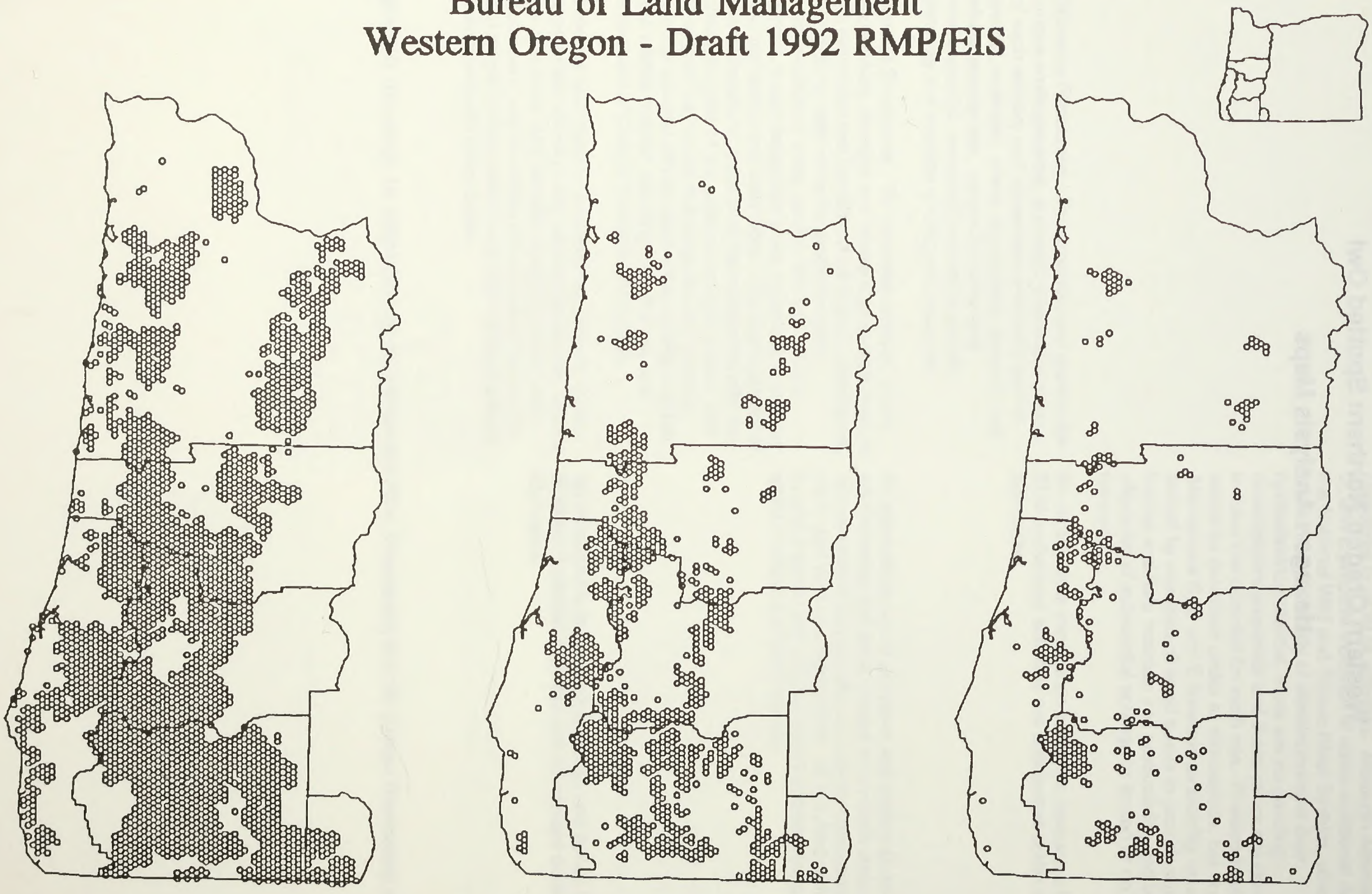

Percent BLM Ownership within 2500 acre Hexagons

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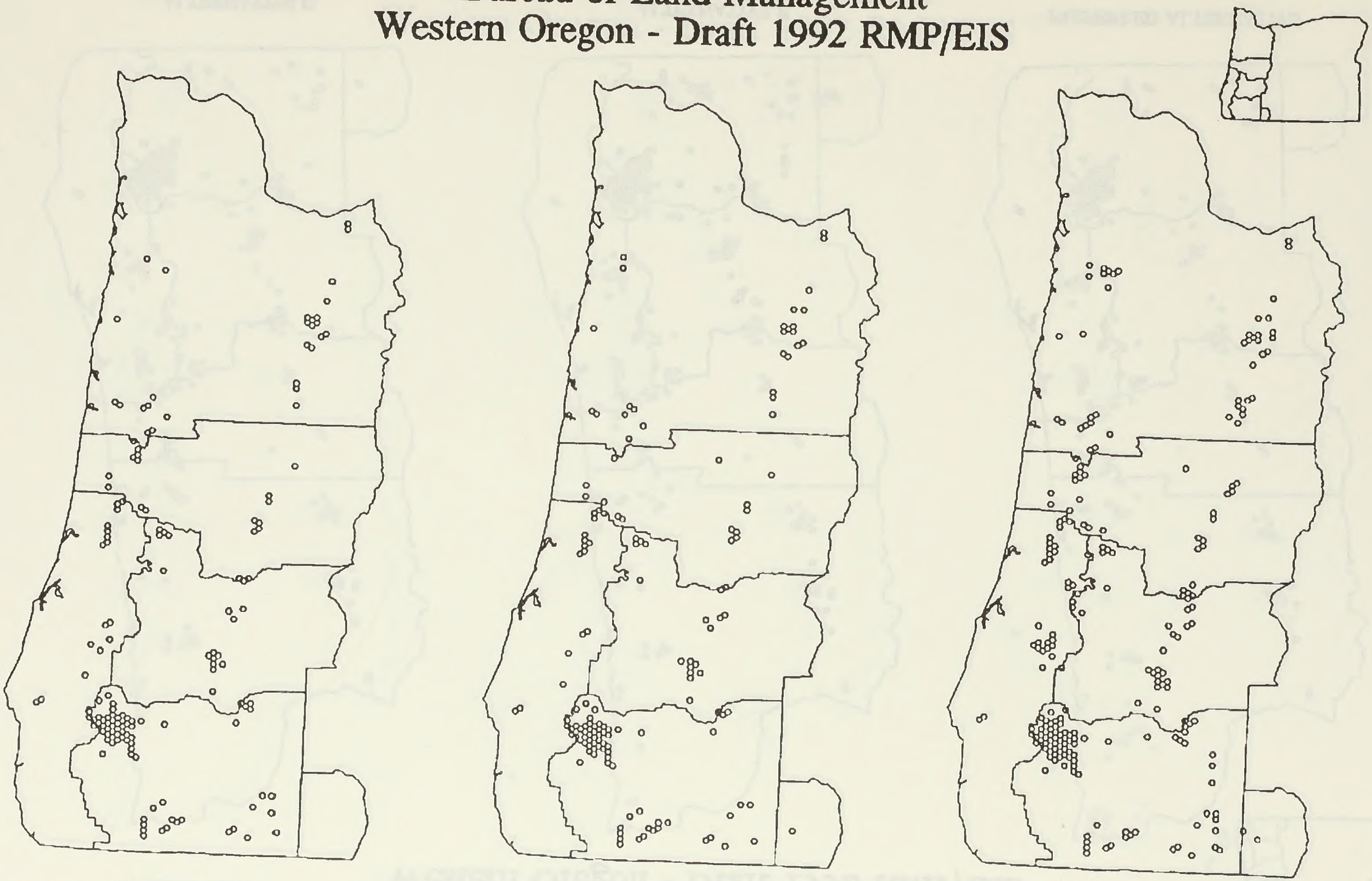

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

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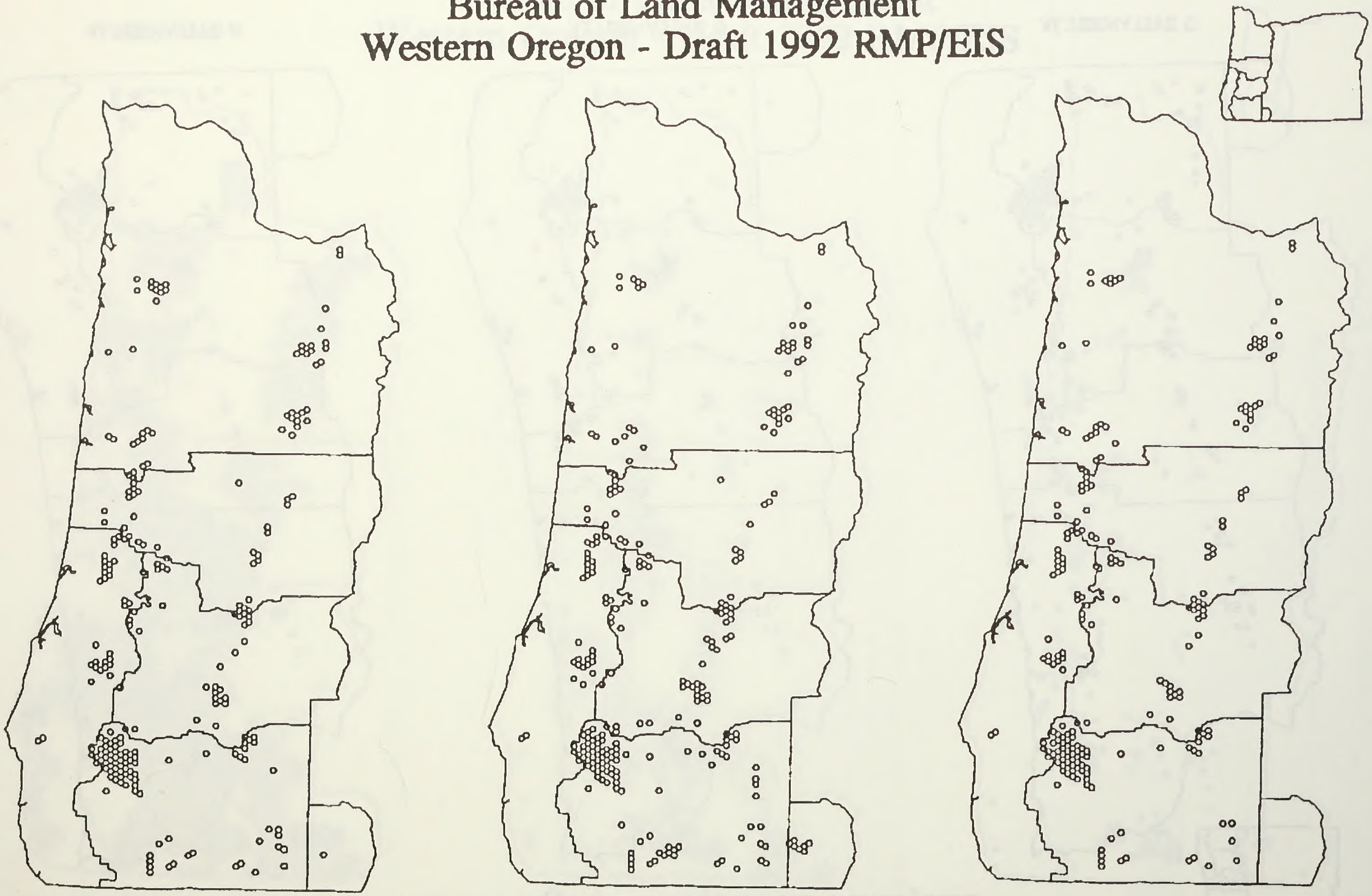

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

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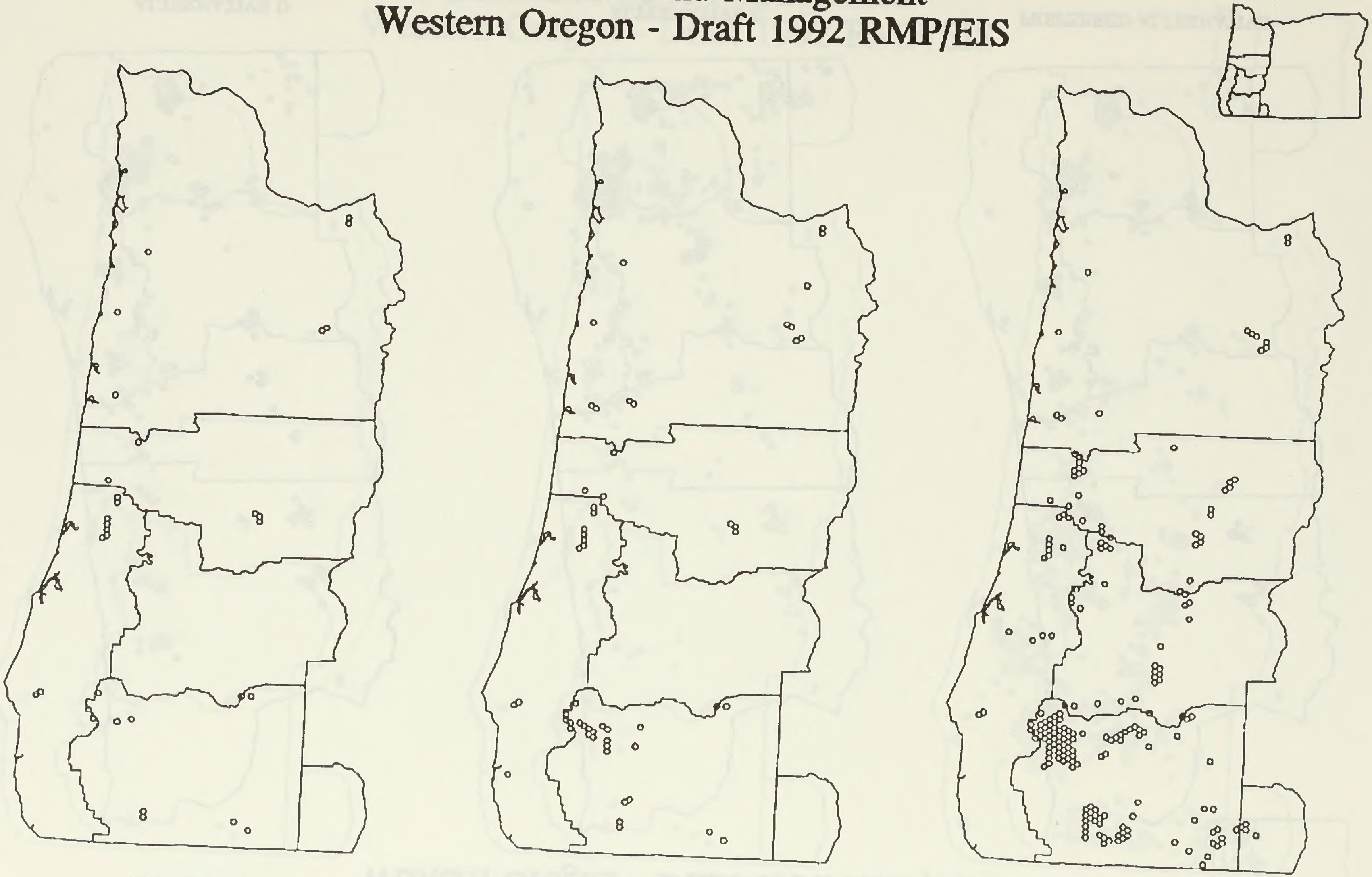

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C *

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 50 Years

* ALTERNATIVE C - AFTER 70 YEARS

U.S. DEPARTMENT OF INTERIOR

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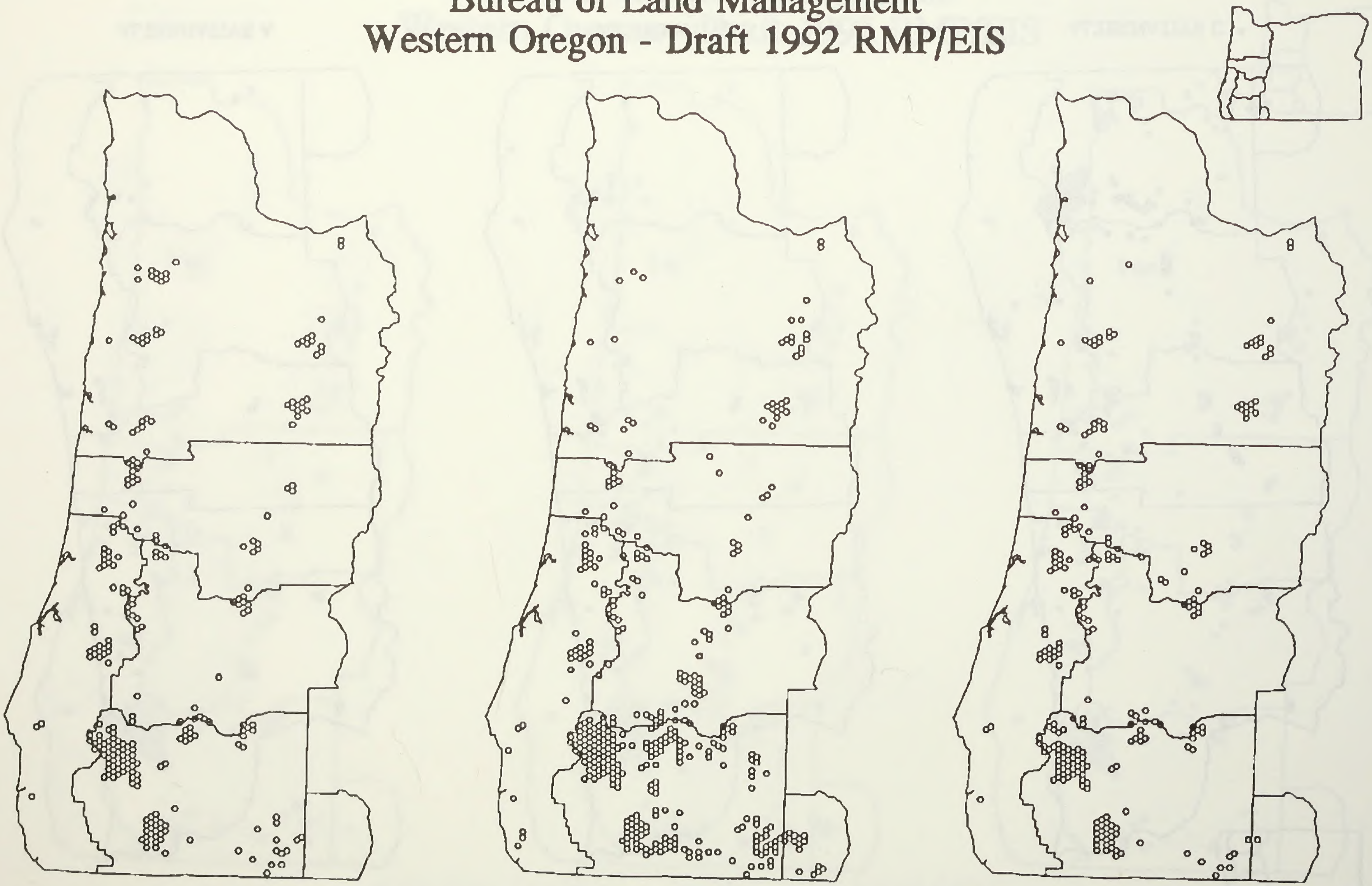
Western Oregon - Draft 1992 RMP/EIS



ALTERNATIVE D

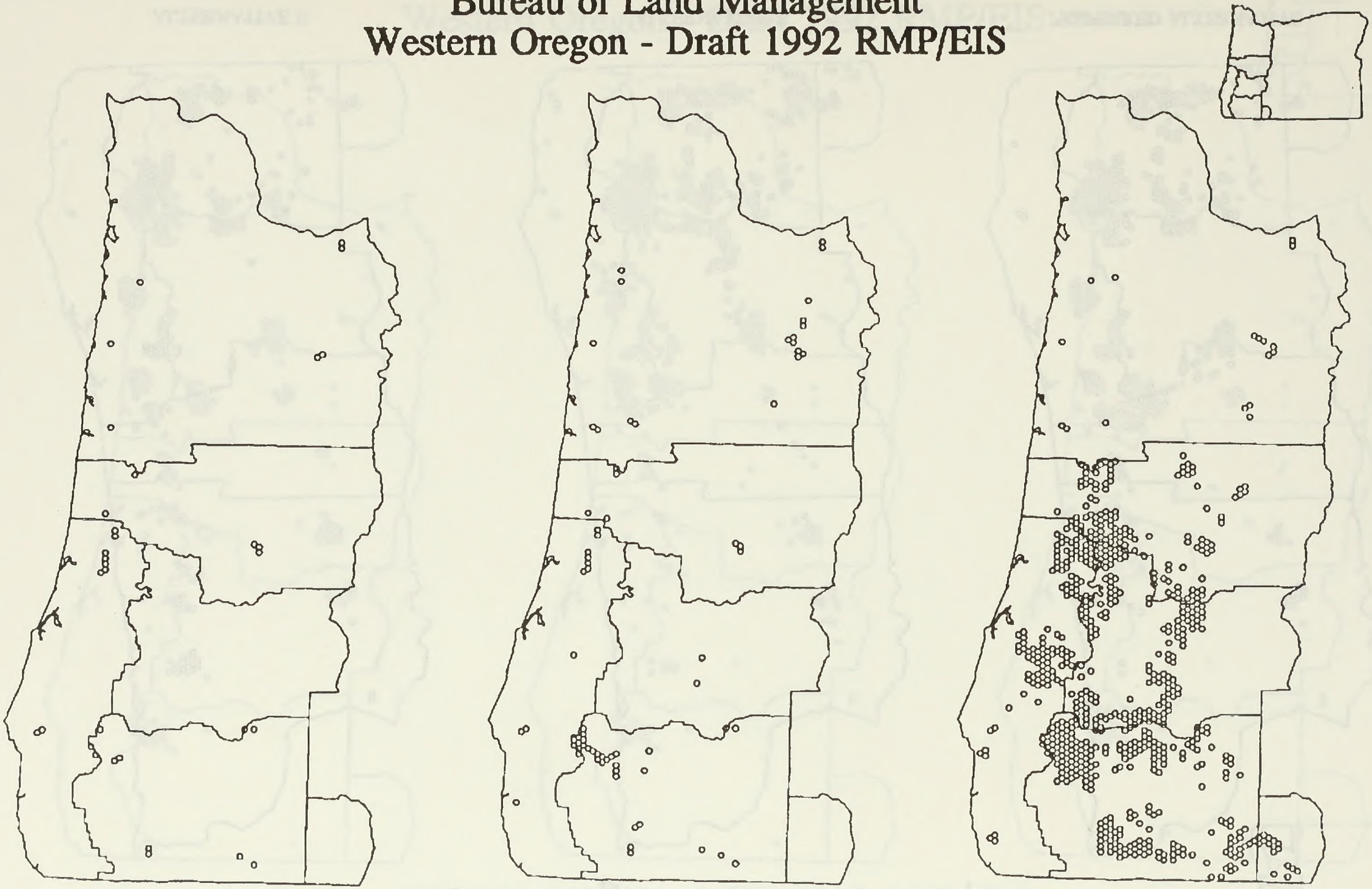
ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 70 Years

U.S. DEPARTMENT OF INTERIOR

Bureau of Land Management
Western Oregon - Draft 1992 RMP/EIS



ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

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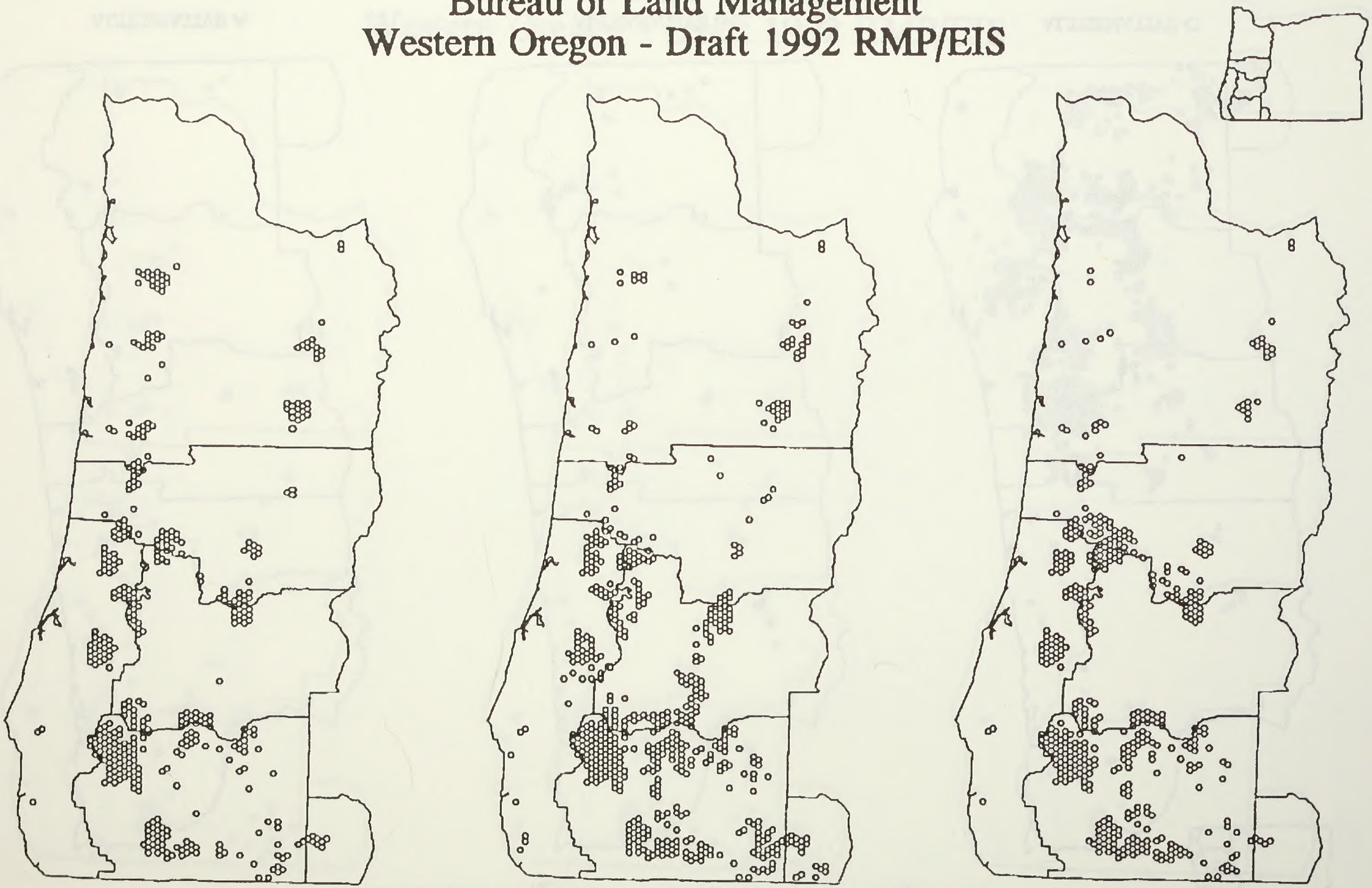

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

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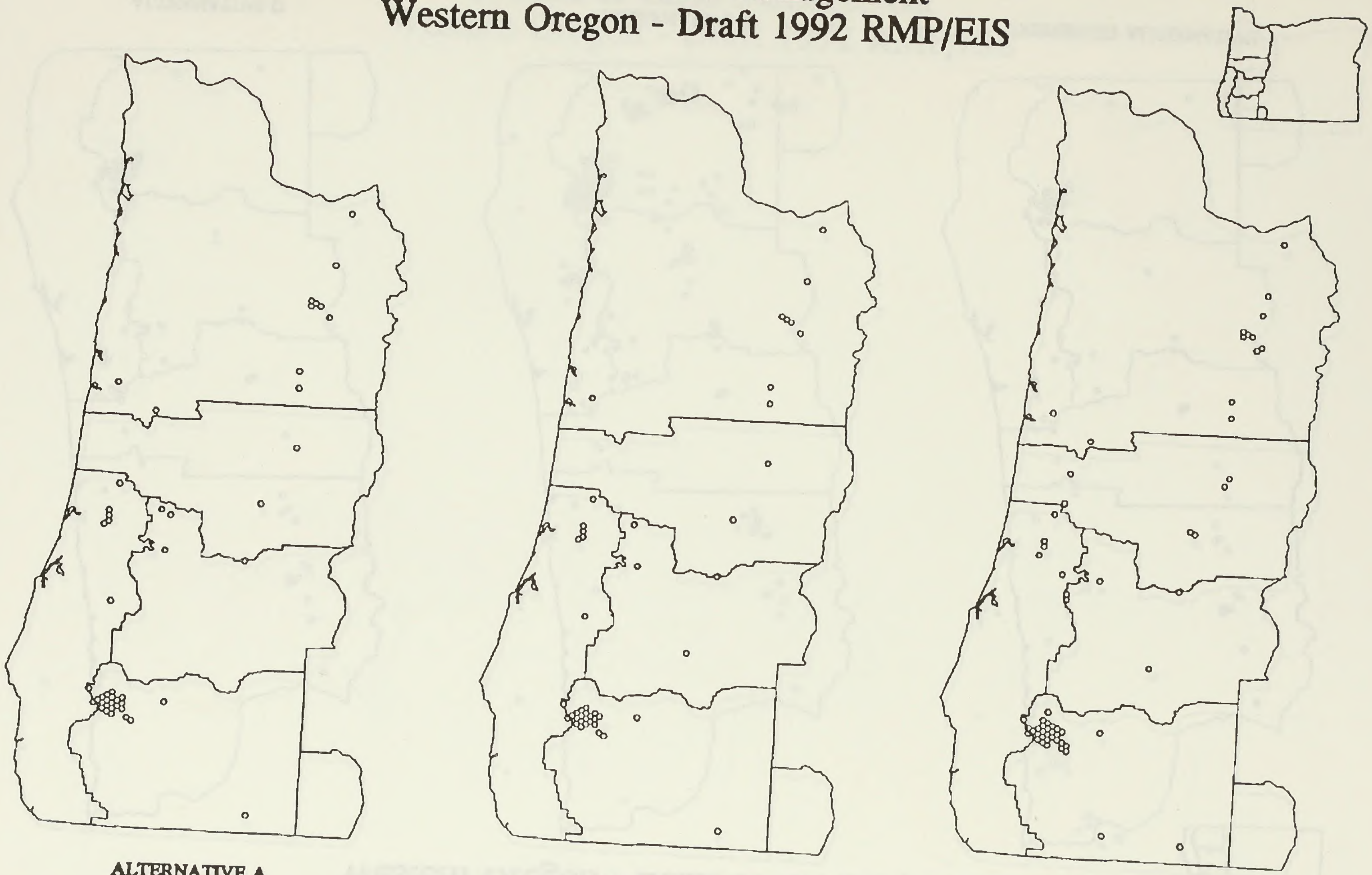

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years

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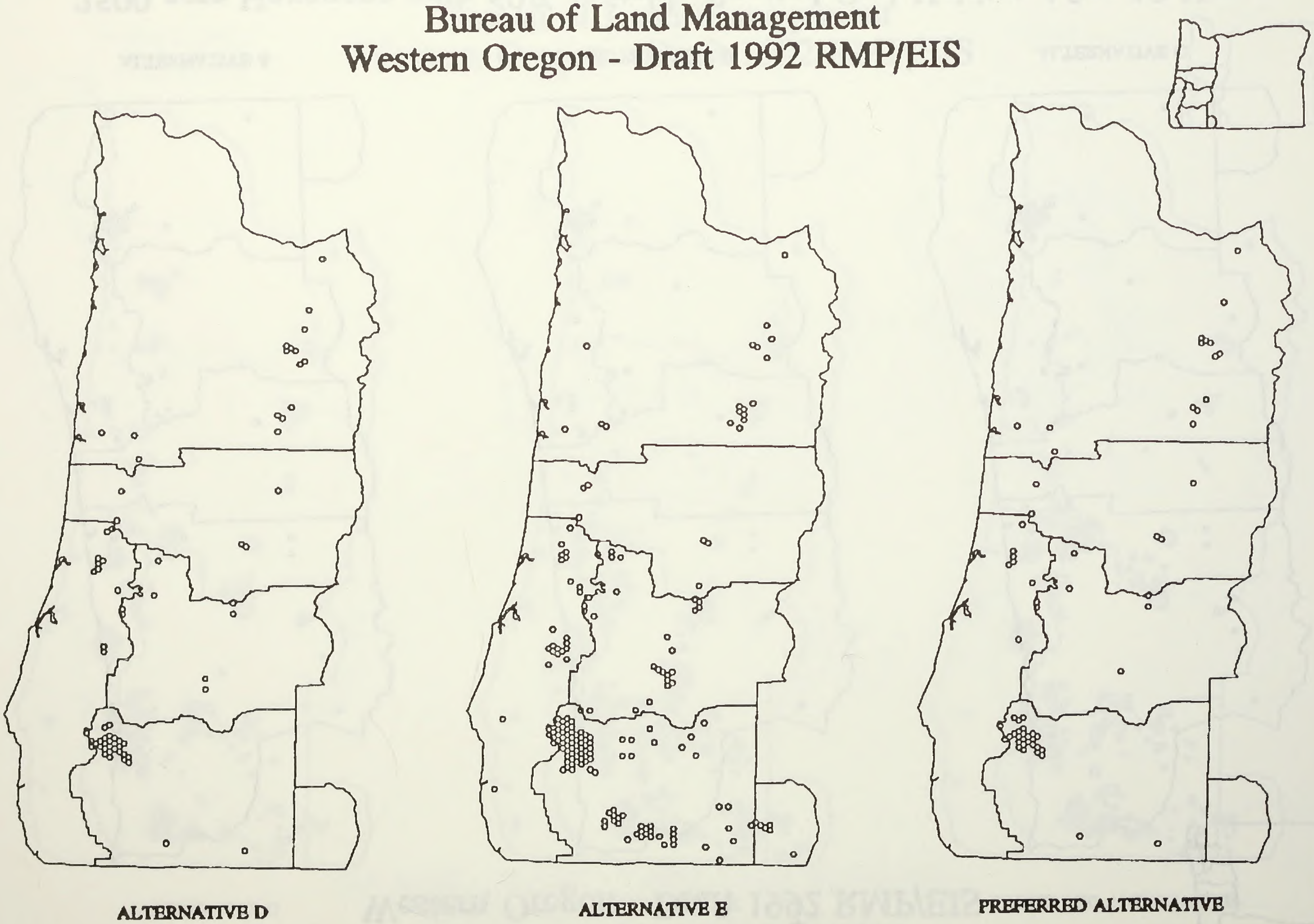

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years

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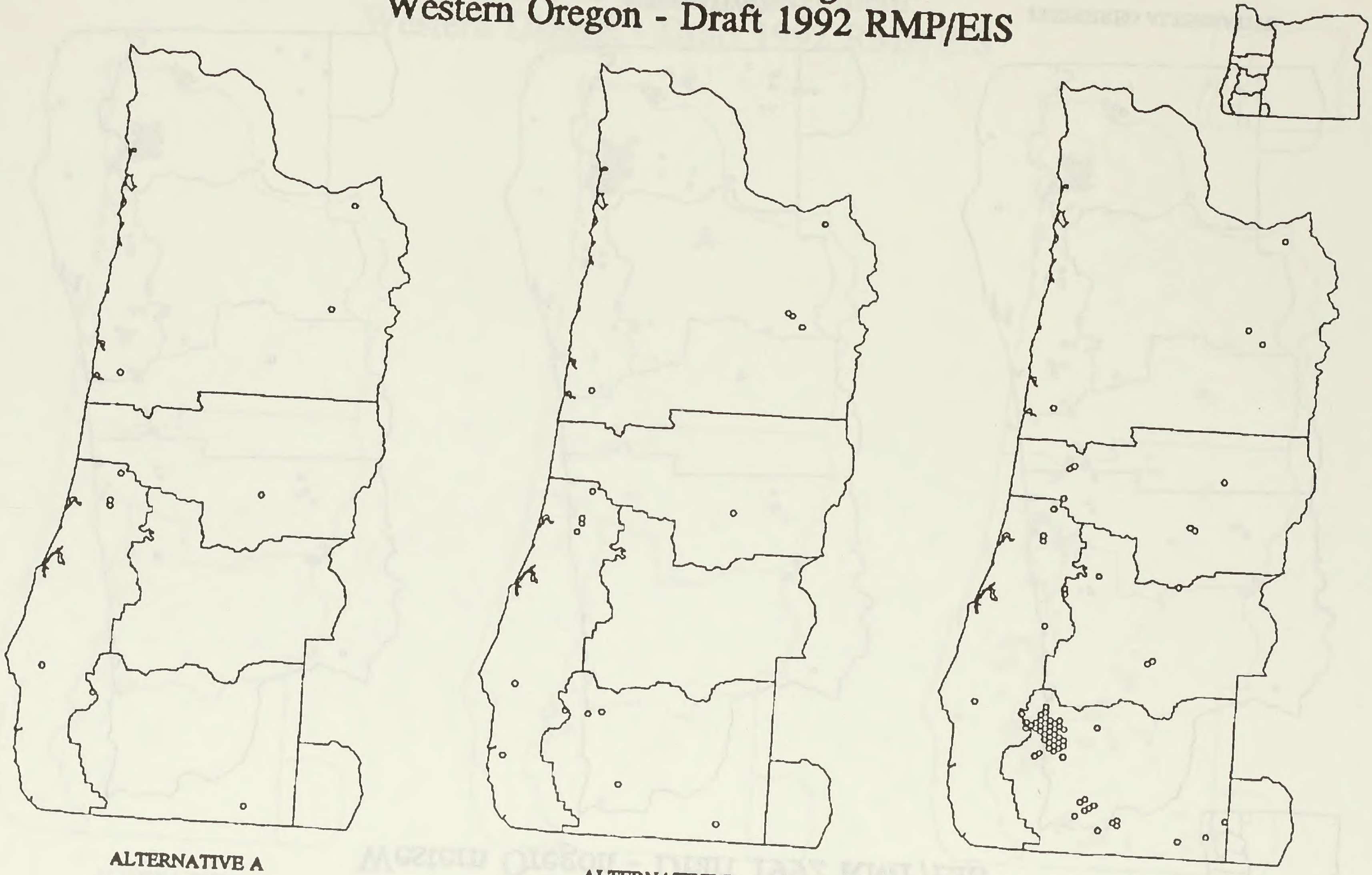

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C *

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 50 Years

* ALTERNATIVE C - AFTER 70 YEARS

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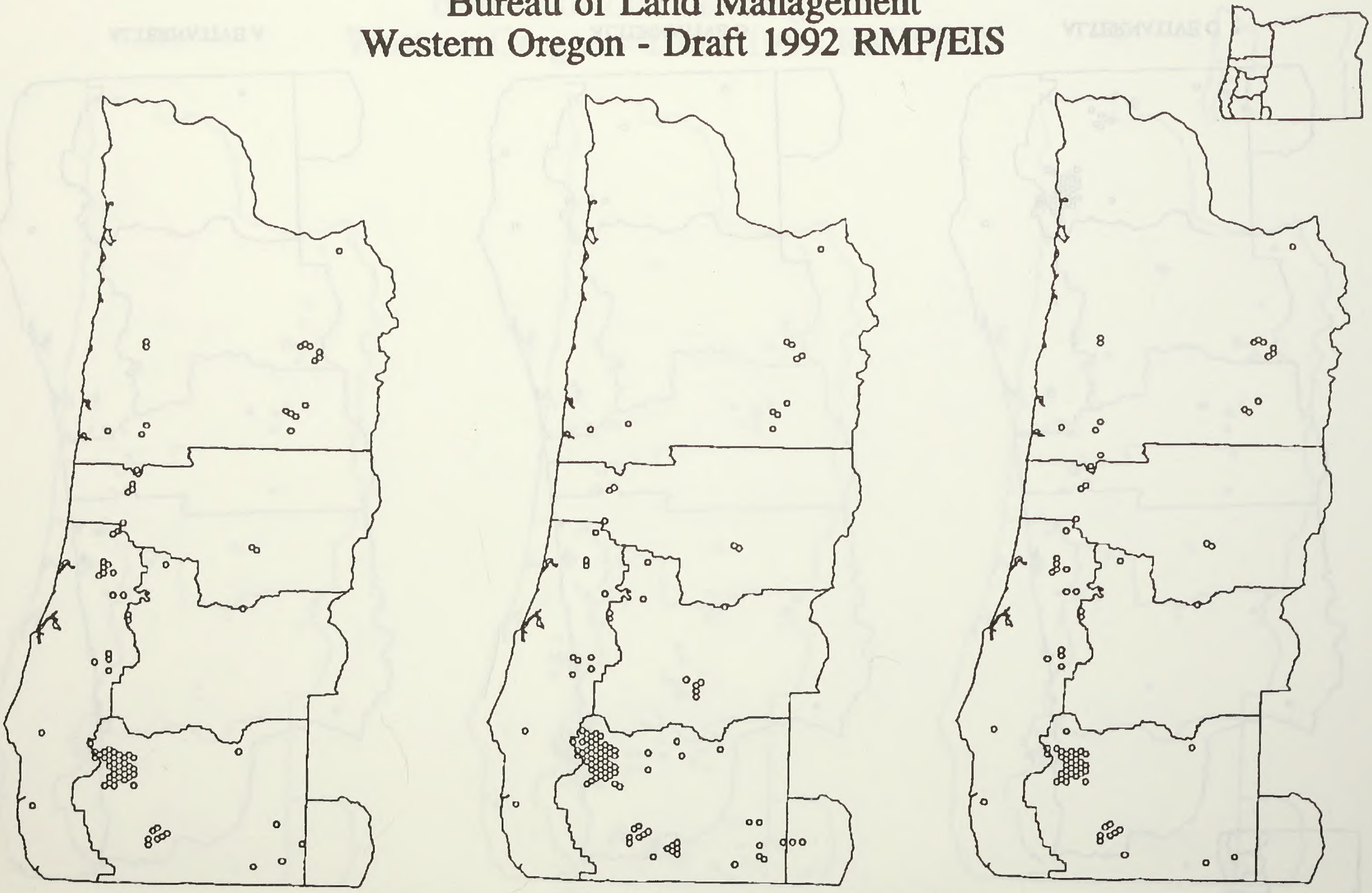

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 70 Years

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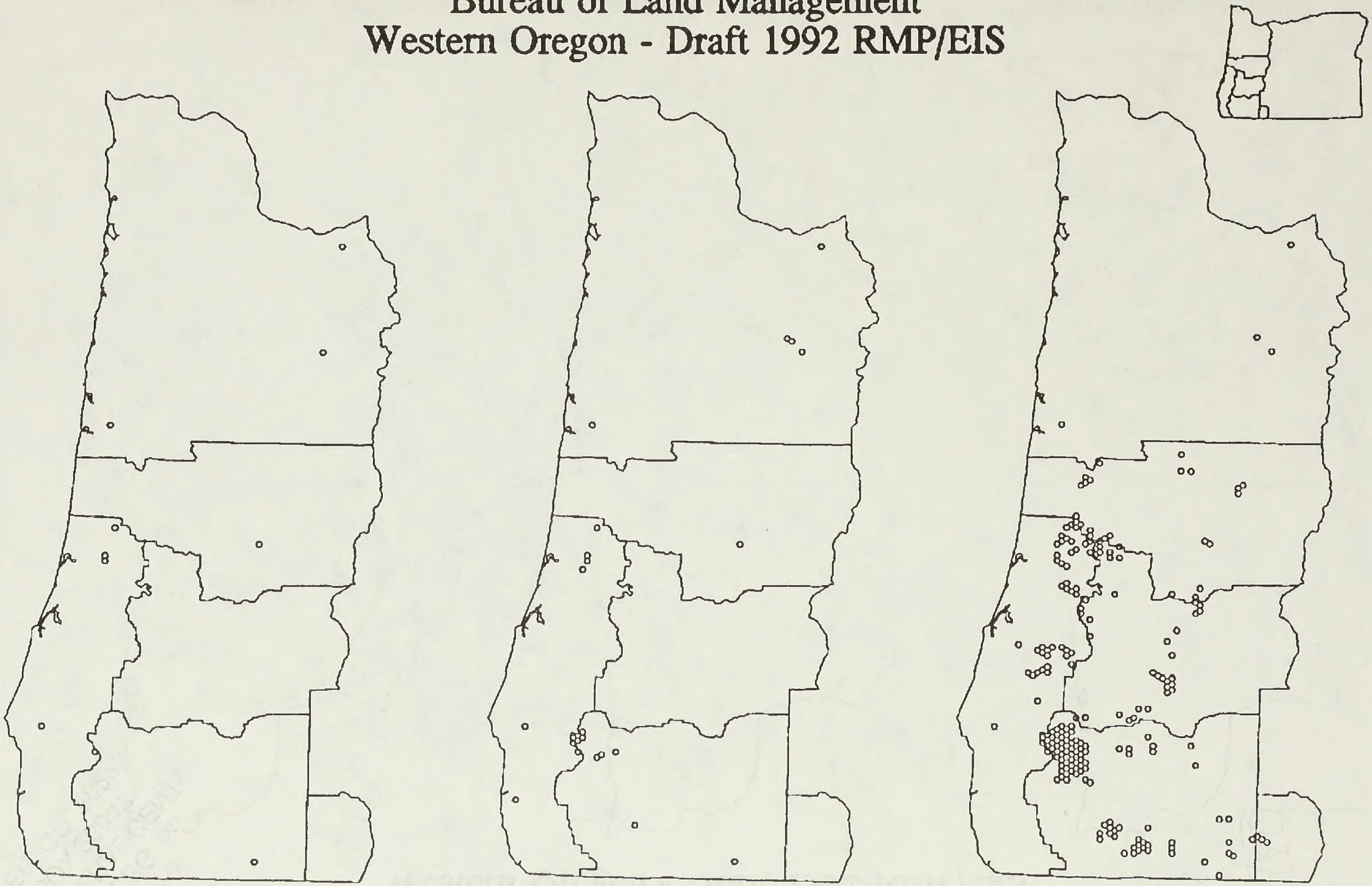

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

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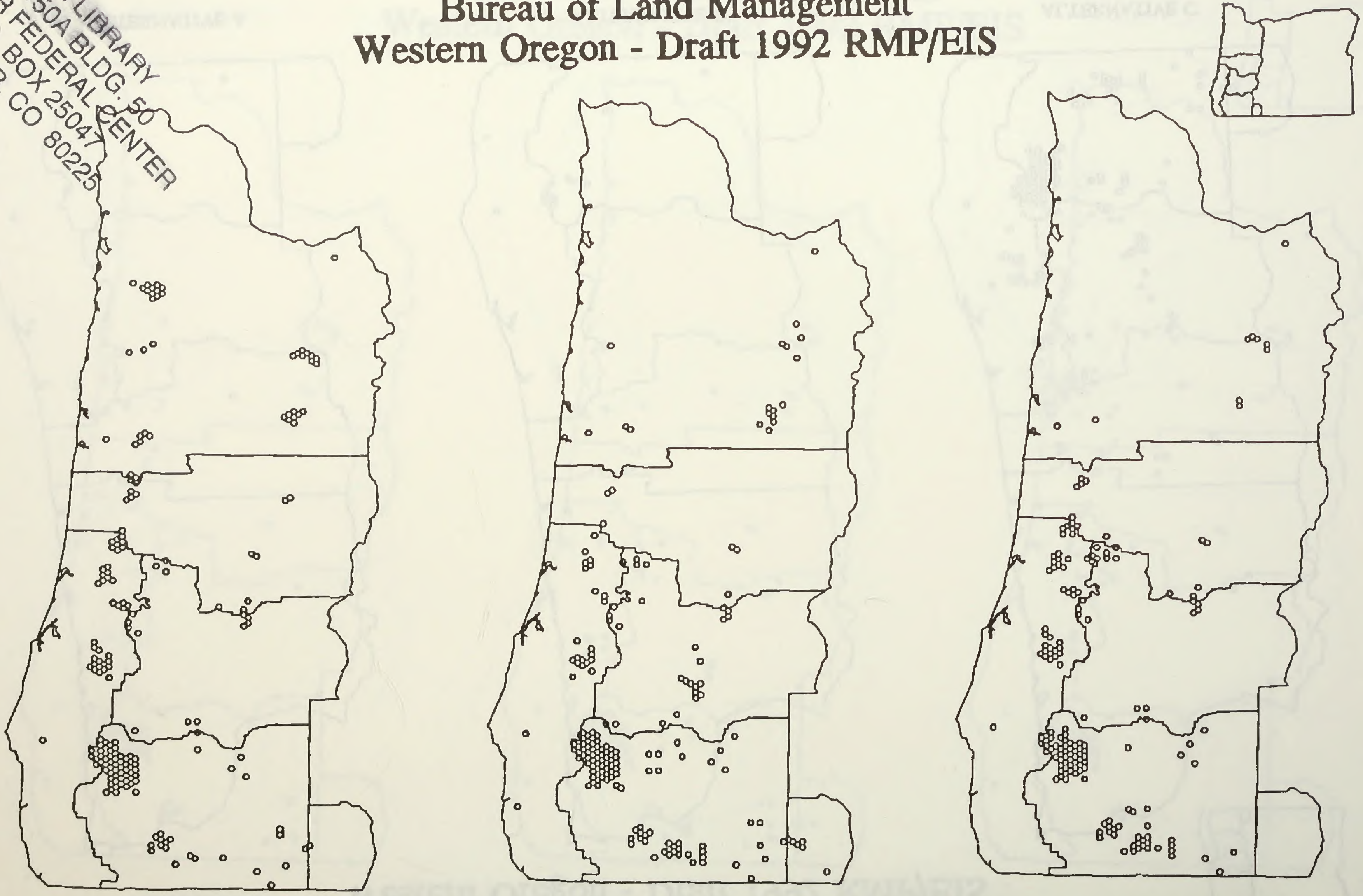

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

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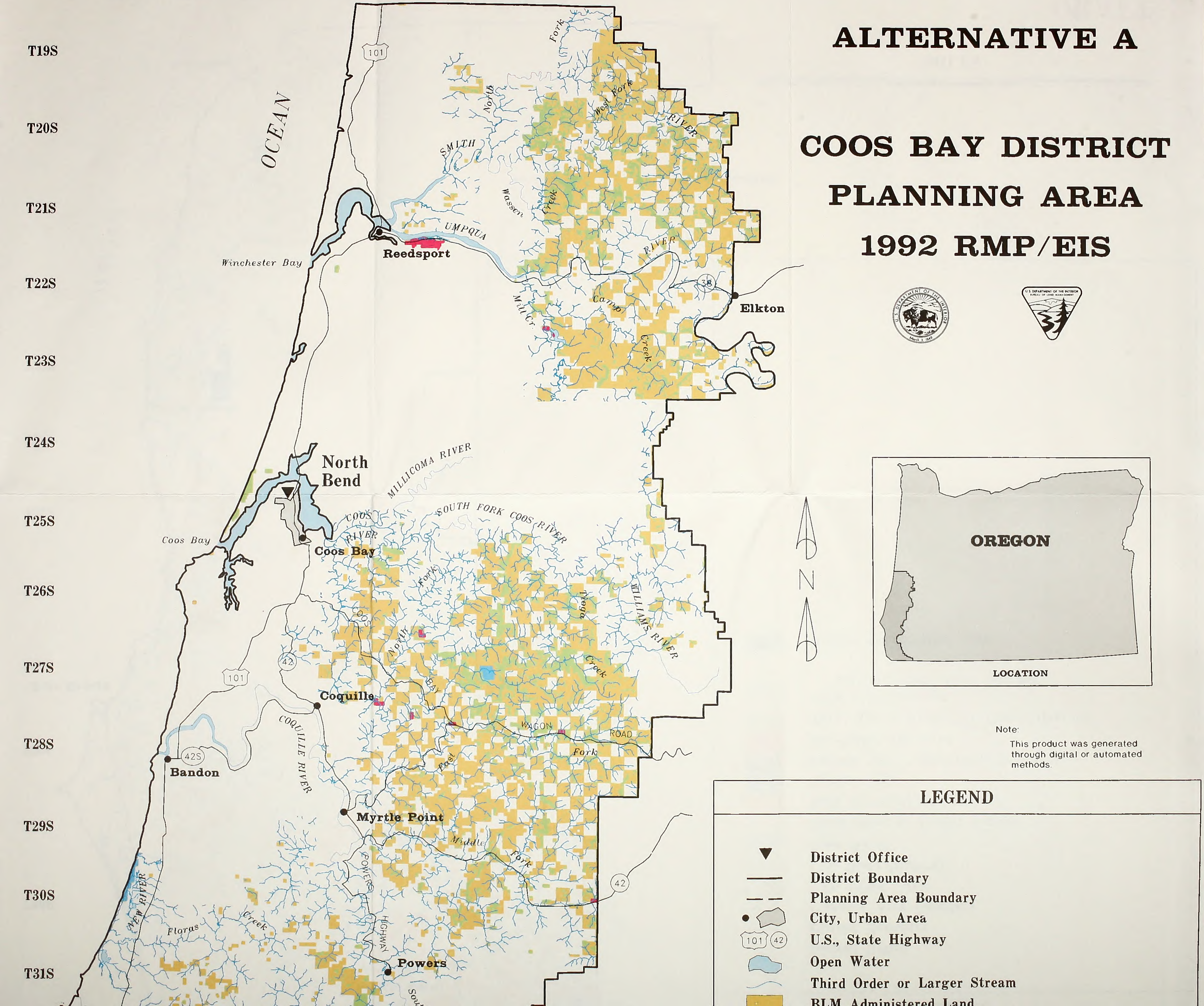
ALTERNATIVE A

COOS BAY DISTRICT PLANNING AREA 1992 RMP/EIS



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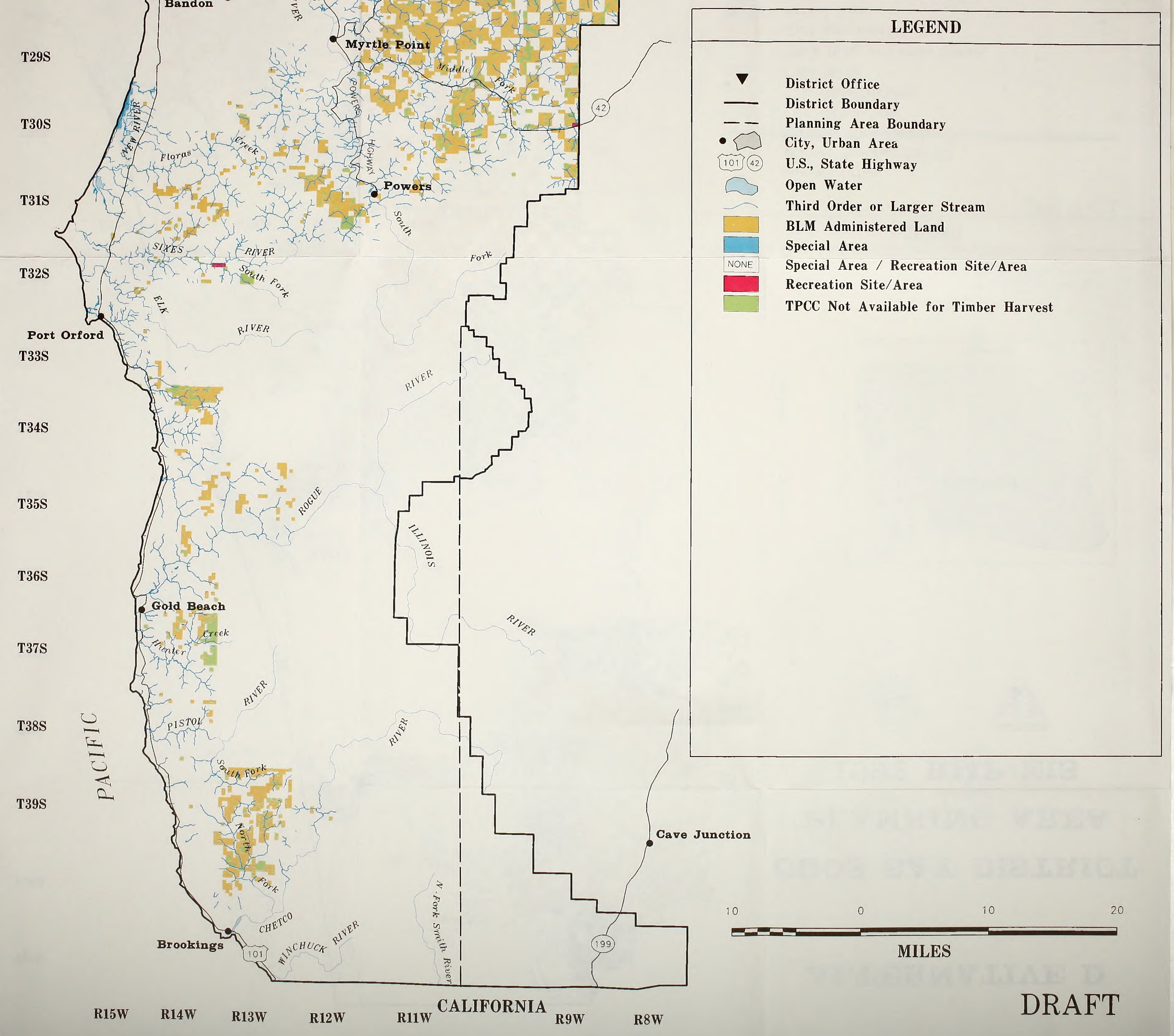
LEGEND

- ▼ District Office
- — District Boundary
- – – Planning Area Boundary
- ● City, Urban Area
- 101 42 U.S., State Highway
- Open Water
- Third Order or Larger Stream
- BLM Administered Land


LEGEND
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District Boundary
Planning Area Boundary
City, Urban Area
101 42 U.S., State Highway
Open Water
Third Order or Larger Stream
BLM Administered Land
Special Area
NONE Special Area / Recreation Site/Area
Recreation Site/Area
TPCC Not Available for Timber Harvest
10 0 10 20
MILES
Bandon
Myrtle Point
Middle Fork
42
POWERS HIGHWAY
Powers
South Fork
NEW RIVER
Floras Creek
SIXES RIVER
South Fork
ELK RIVER
Port Orford
RIVER
ROGUE
ILLINOIS RIVER
Gold Beach
Hunter Creek
RIVER
PISTOL RIVER
South Fork
North Fork
CHETCO RIVER
WINCHUCK RIVER
N. Fork Smith River
Brookings
101
199
Cave Junction
PACIFIC
CALIFORNIA
T29S
T30S
T31S
T32S
T33S
T34S
T35S
T36S
T37S
T38S
T39S
R15W
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R9W
R8W

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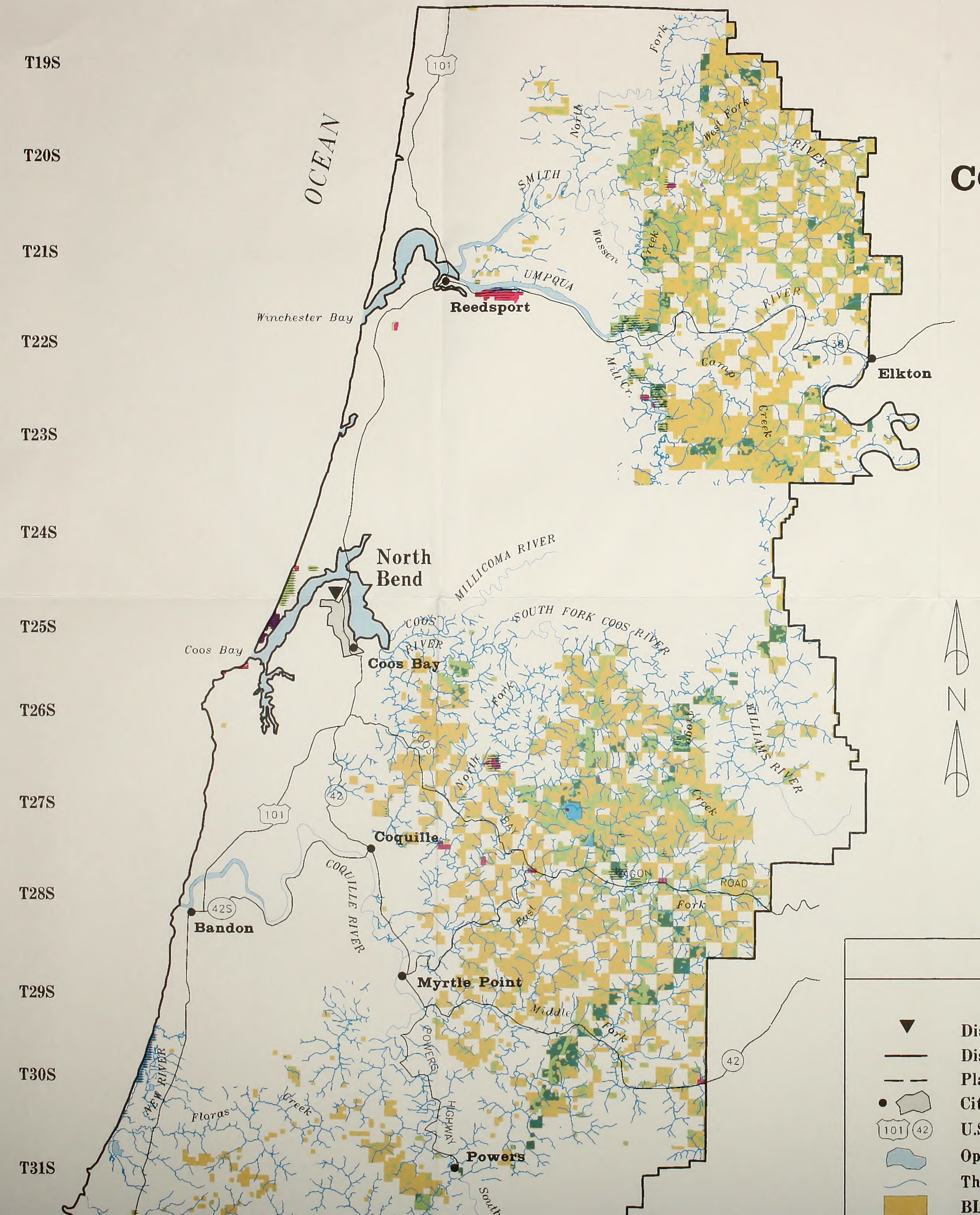
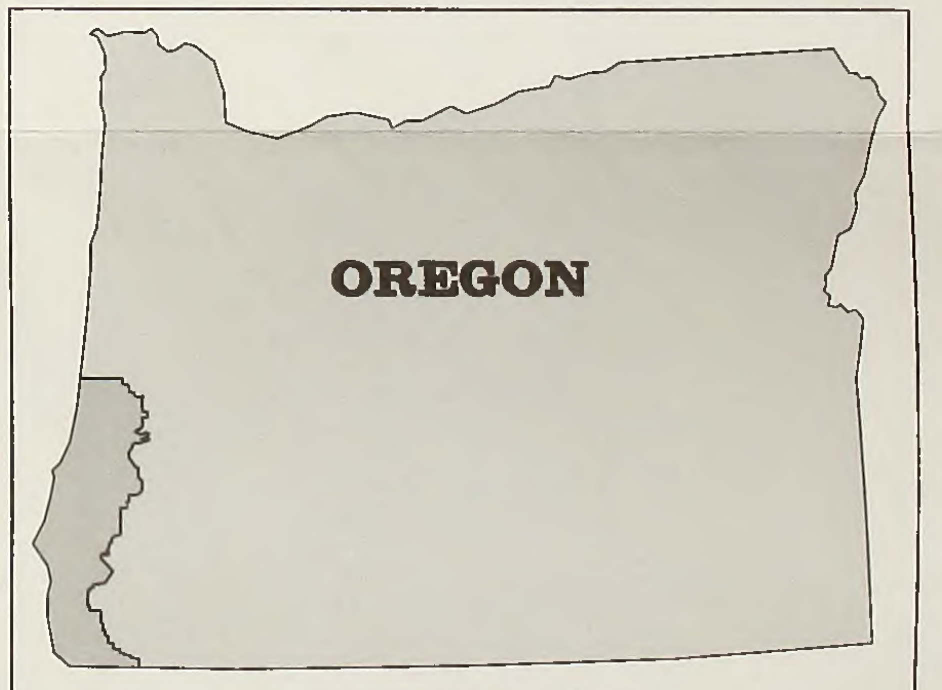
ALTERNATIVE B

COOS BAY DISTRICT PLANNING AREA 1992 RMP/EIS





LOCATION

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LEGEND

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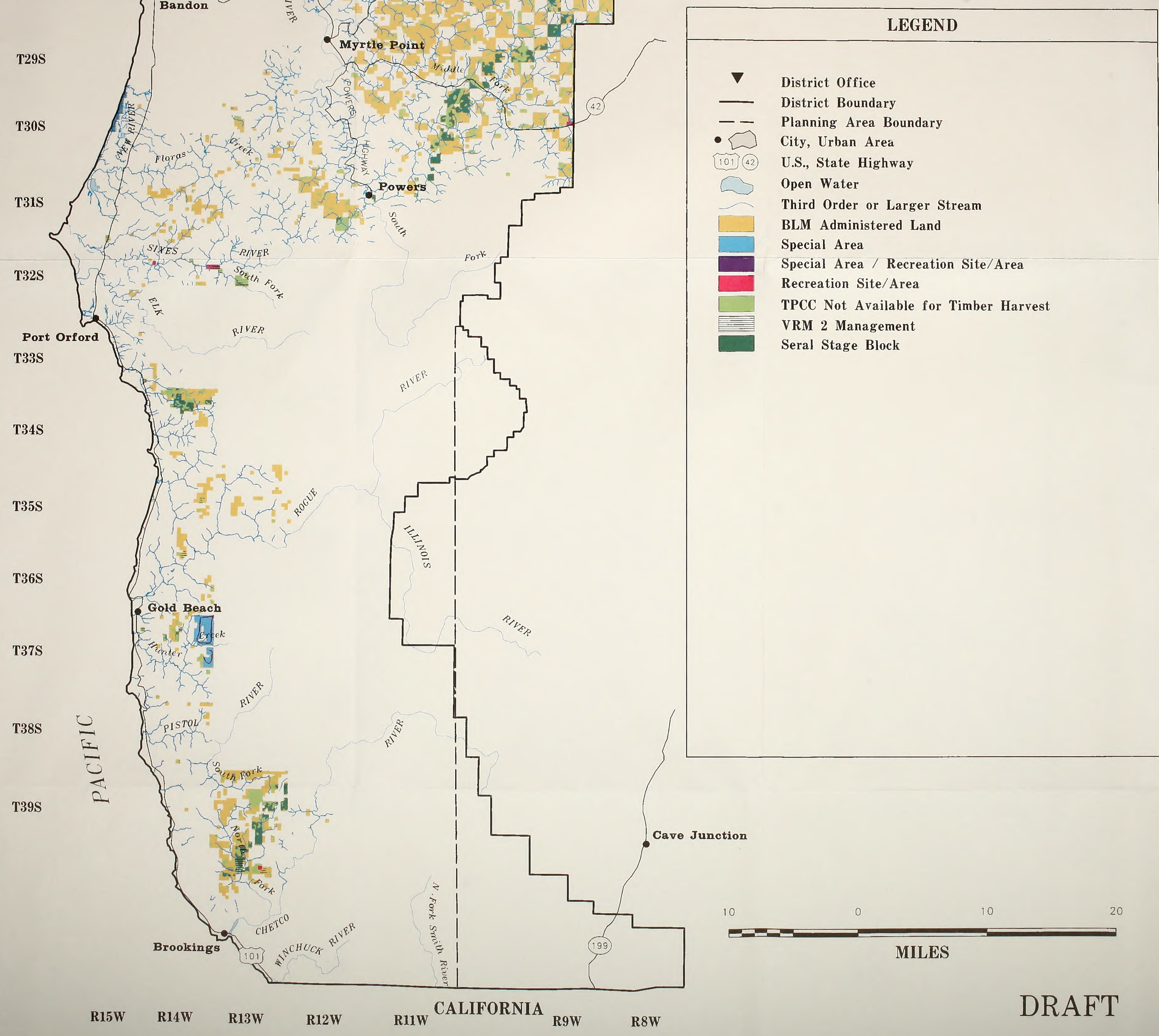
– – Planning Area Boundary
● City, Urban Area
101 42 U.S., State Highway
Open Water
Third Order or Larger Stream
▨ BLM Administered Land

methods.



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ALTERNATIVE C

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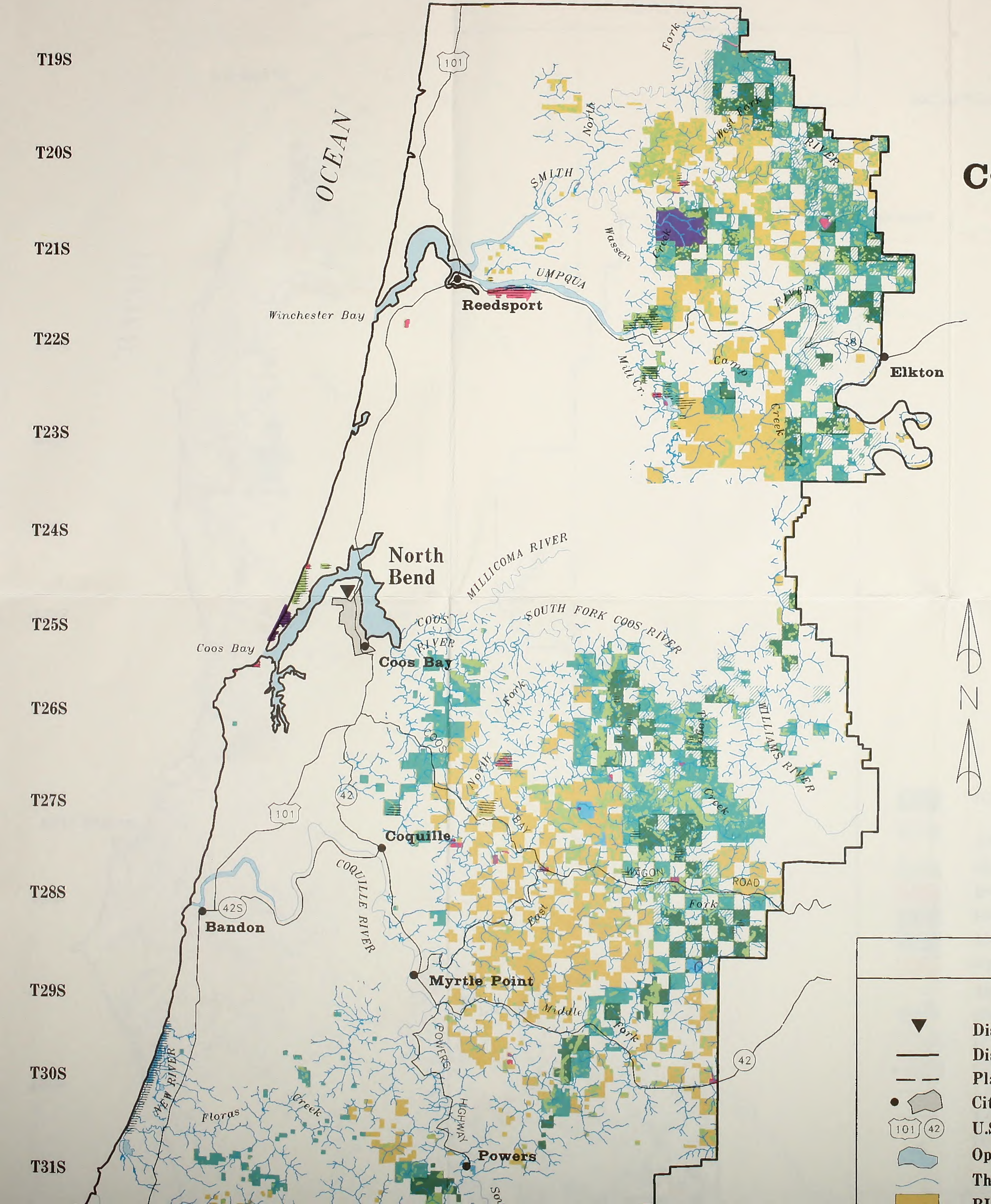

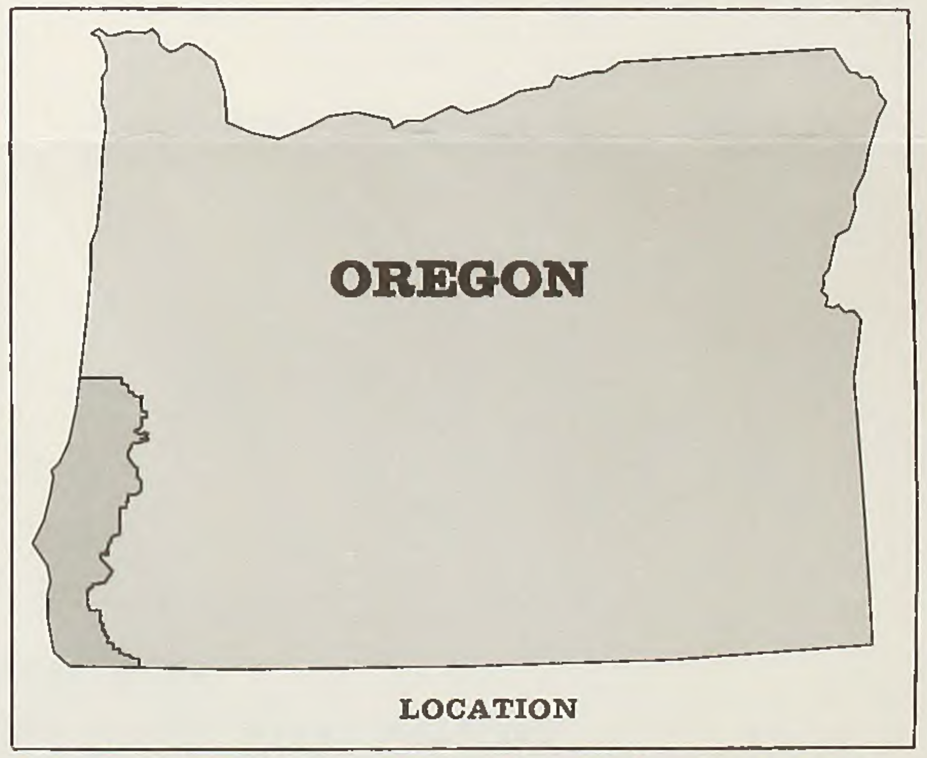

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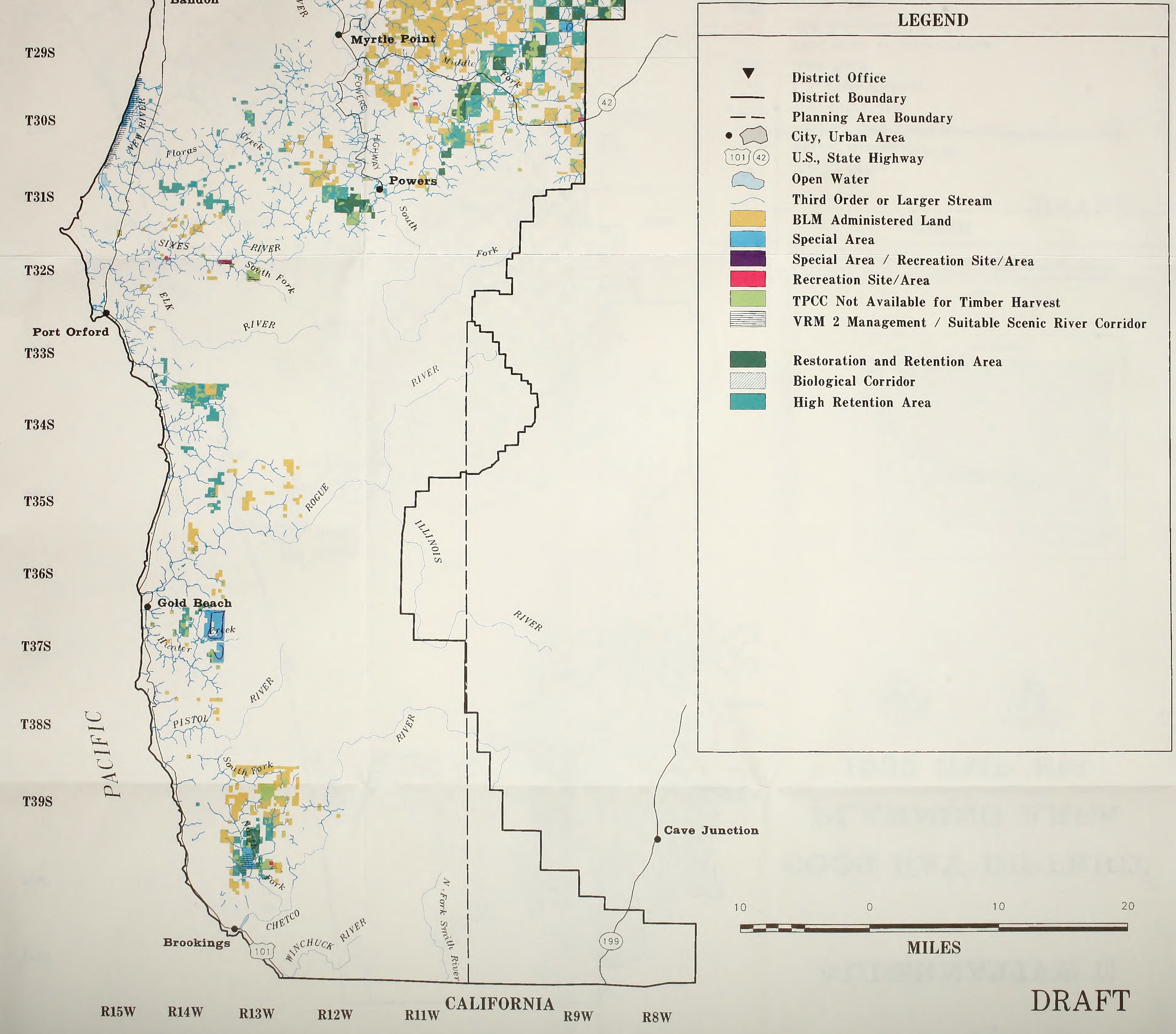
- 101 42 U.S., State Highway
- Open Water
- Third Order or Larger Stream
- 🟨 BLM Administered Land


LEGEND
▼ District Office
District Boundary
Planning Area Boundary
City, Urban Area
101 42 U.S., State Highway
Open Water
Third Order or Larger Stream
BLM Administered Land
Special Area
Special Area / Recreation Site/Area
Recreation Site/Area
TPCC Not Available for Timber Harvest
VRM 2 Management / Suitable Scenic River Corridor
Restoration and Retention Area
Biological Corridor
High Retention Area
10
0
10
20
MILES
Bandon
Myrtle Point
Middle Fork
POWERS HIGHWAY
Powers
South Fork
42
NEW RIVER
Floras Creek
SIXES RIVER
South Fork
ELK RIVER
Port Orford
RIVER
ROGUE
ILLINOIS RIVER
Gold Beach
Hunter Creek
RIVER
PISTOL RIVER
South Fork
North Fork
CHETCO RIVER
WINCHUCK RIVER
N. Fork Smith River
Brookings
101
199
Cave Junction
PACIFIC
CALIFORNIA
T29S
T30S
T31S
T32S
T33S
T34S
T35S
T36S
T37S
T38S
T39S
R15W
R14W
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R12W
R11W
R9W
R8W

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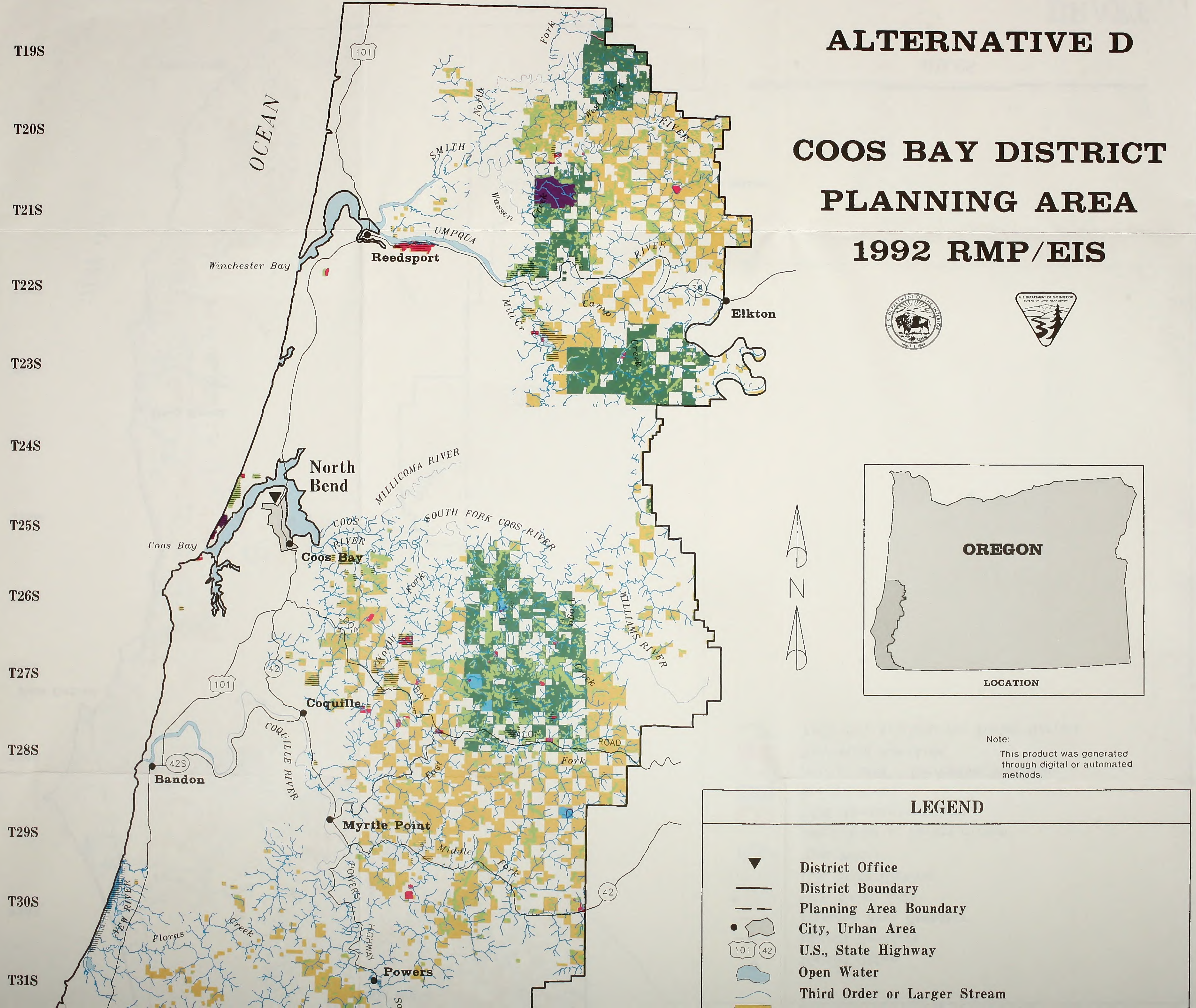
ALTERNATIVE D

COOS BAY DISTRICT PLANNING AREA 1992 RMP/EIS



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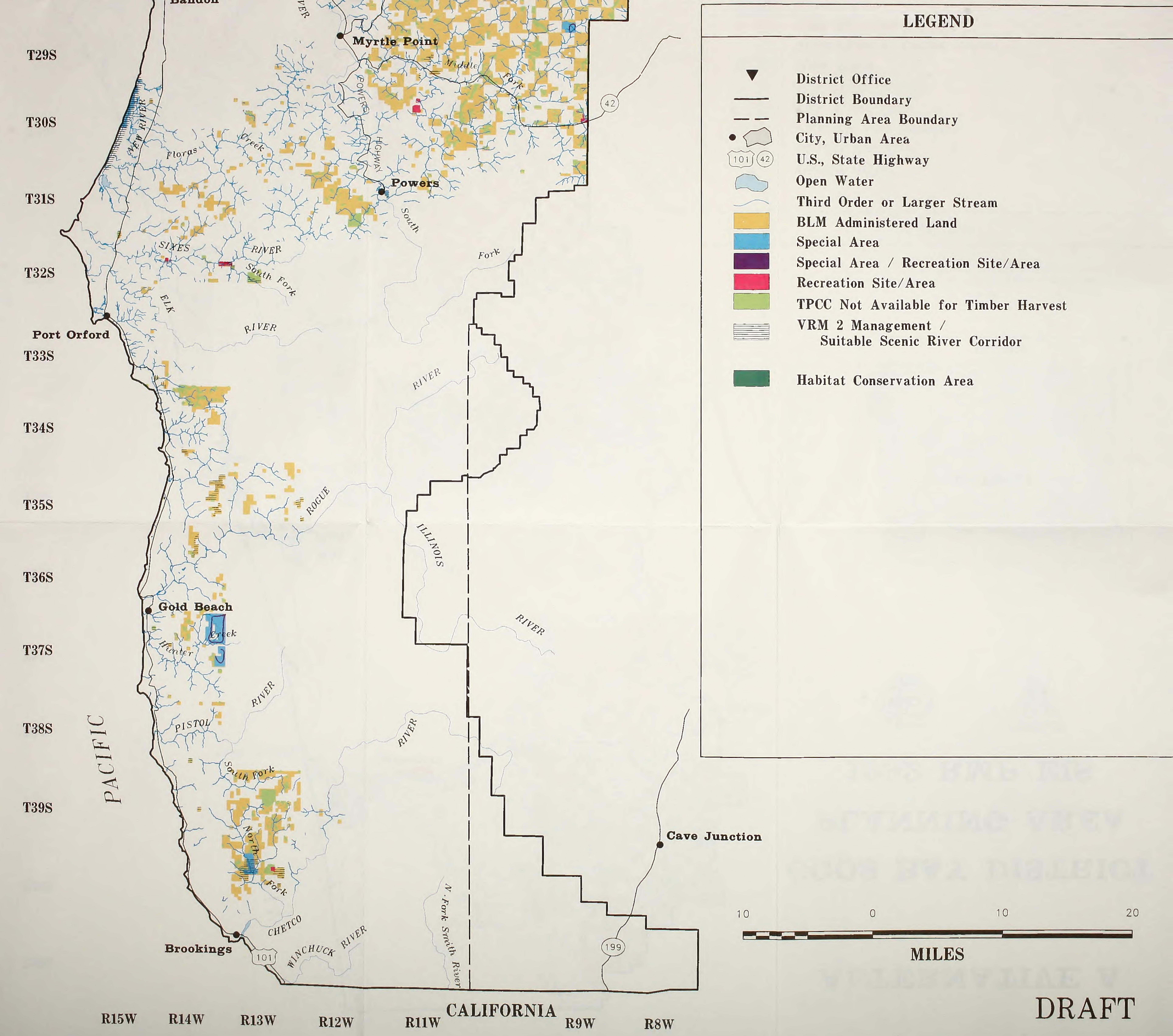
LEGEND
▼ District Office
District Boundary
Planning Area Boundary
City, Urban Area
101 42 U.S., State Highway
Open Water
Third Order or Larger Stream
BLM Administered Land
Special Area
Special Area / Recreation Site/Area
Recreation Site/Area
TPCC Not Available for Timber Harvest
VRM 2 Management / Suitable Scenic River Corridor
Habitat Conservation Area
10
0
10
20
MILES
Bandon
Myrtle Point
Middle Fork
42
NEW RIVER
Floras
Creek
POWERS HIGHWAY
Powers
South Fork
SIXES RIVER
South Fork
ELK
Port Orford
RIVER
RIVER
ROGUE
ILLINOIS
RIVER
Gold Beach
Hunter
Creek
RIVER
PISTOL
RIVER
South Fork
North Fork
CHETCO
WINCHUCK RIVER
Brookings
101
N. Fork Smith River
199
Cave Junction
PACIFIC
CALIFORNIA
T29S
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T32S
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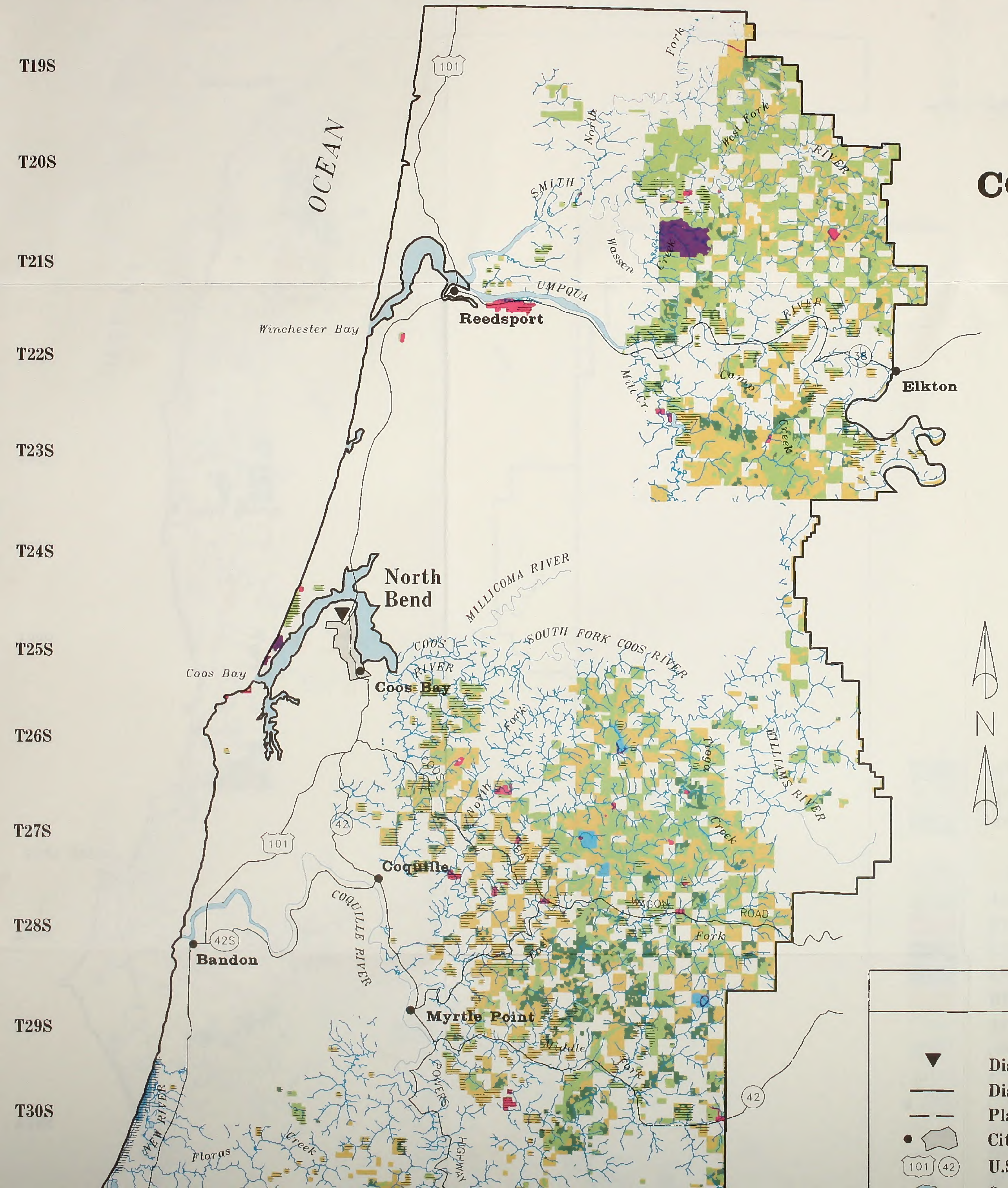
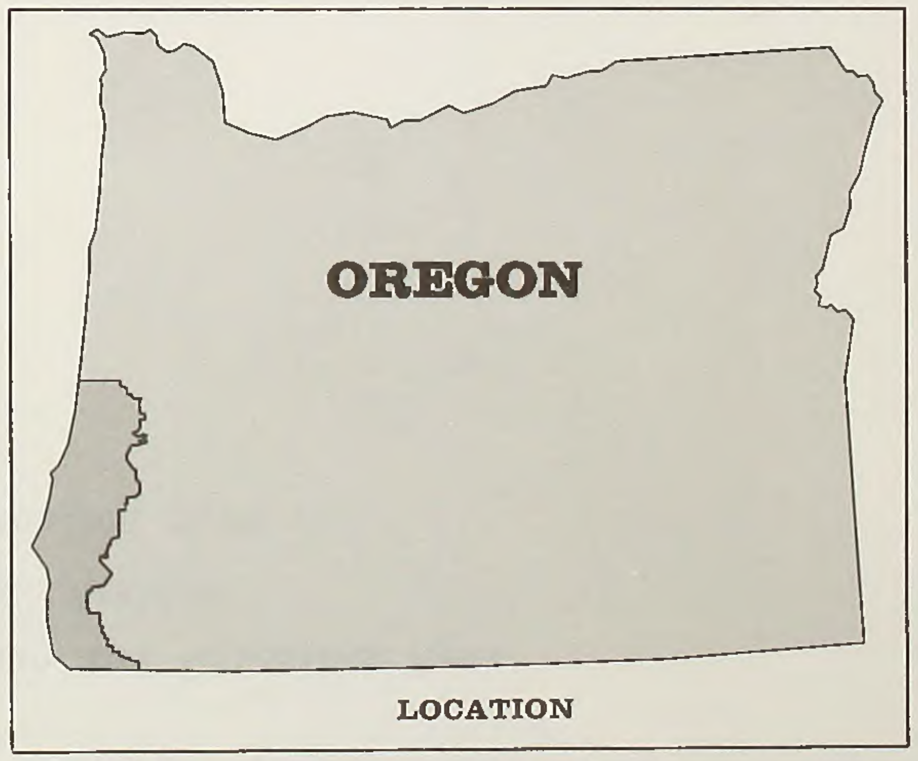
COOS BAY DISTRICT PLANNING AREA 1992 RMP/EIS





LOCATION

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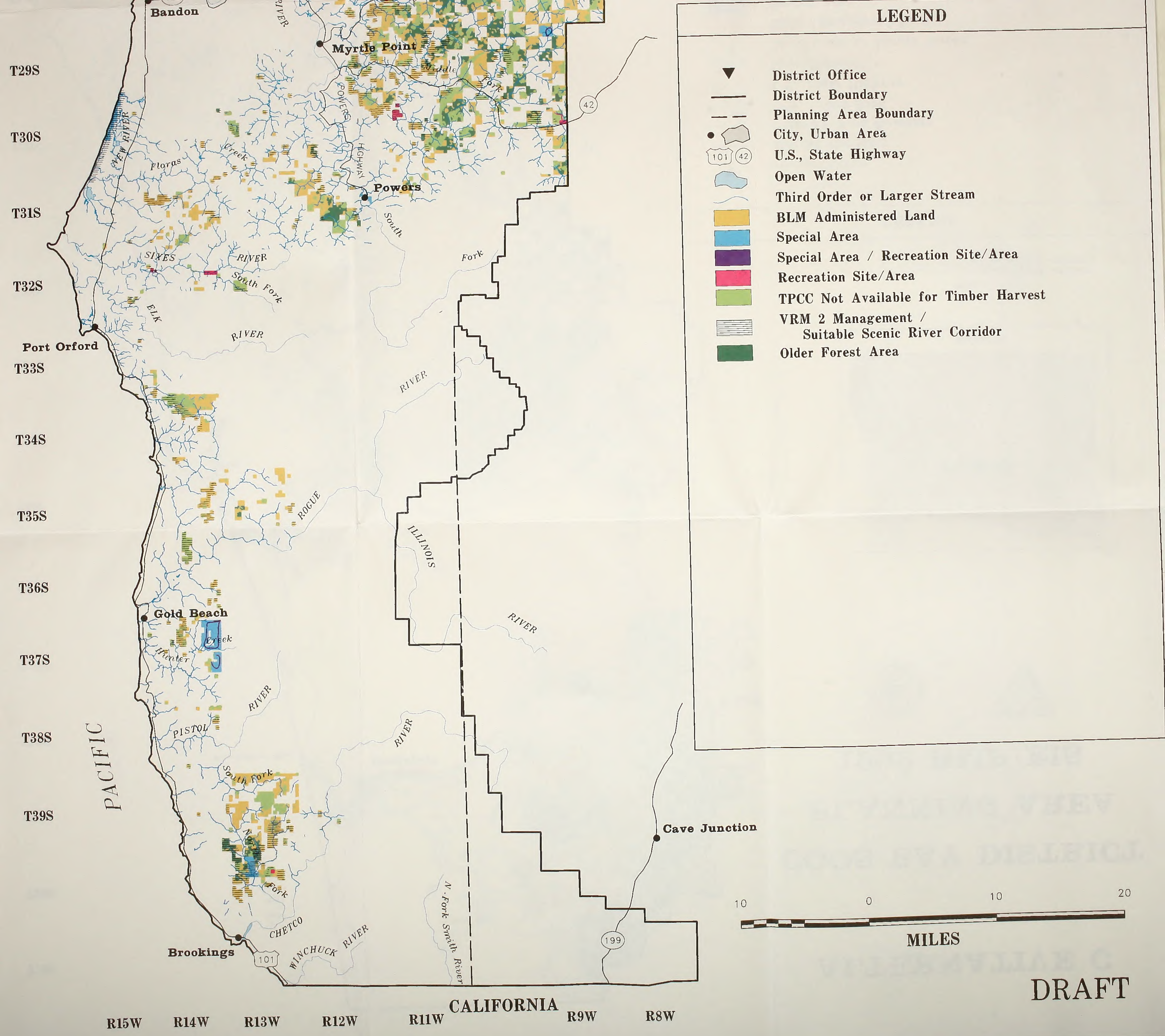
LEGEND

▼	District Office
—	District Boundary
— —	Planning Area Boundary
●	City, Urban Area
101 42	U.S., State Highway


LEGEND
▼ District Office
District Boundary
Planning Area Boundary
City, Urban Area
101 42 U.S., State Highway
Open Water
Third Order or Larger Stream
BLM Administered Land
Special Area
Special Area / Recreation Site/Area
Recreation Site/Area
TPCC Not Available for Timber Harvest
VRM 2 Management / Suitable Scenic River Corridor
Older Forest Area
10
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10
20
MILES
Bandon
Myrtle Point
Powers
Port Orford
Gold Beach
Brookings
Cave Junction
CALIFORNIA
PACIFIC
T29S
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T32S
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T34S
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T36S
T37S
T38S
T39S
R15W
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R13W
R12W
R11W
R9W
R8W
RIVER
Middle Fork
POWERS
HIGHWAY
42
NEW RIVER
Floras Creek
SIXES RIVER
South Fork
ELK RIVER
South Fork
RIVER
ROGUE
ILLINOIS
RIVER
Hunter Creek
PISTOL RIVER
RIVER
South Fork
Fork
CHETCO
WINCHUCK RIVER
N. Fork Smith River
101
199

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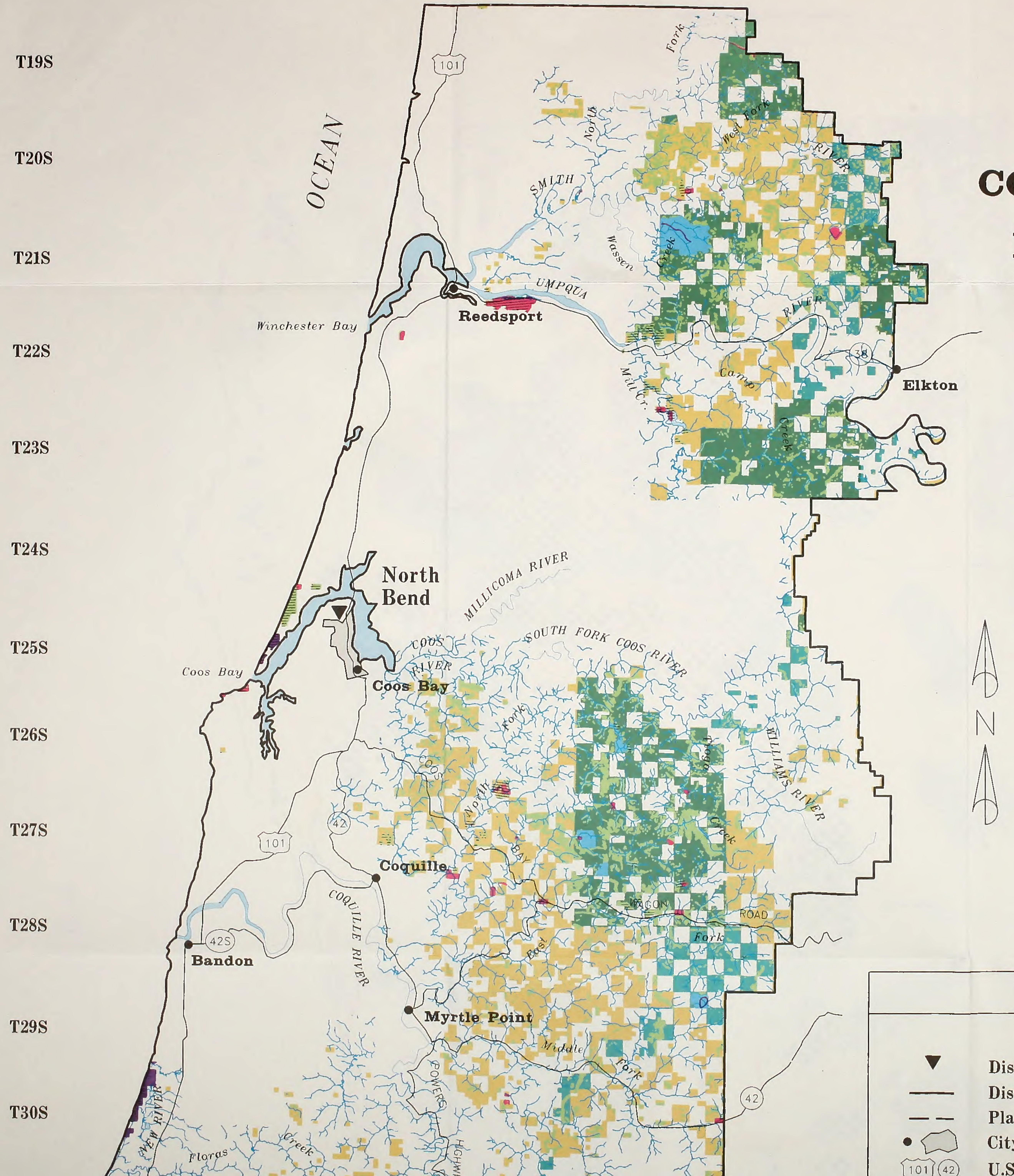
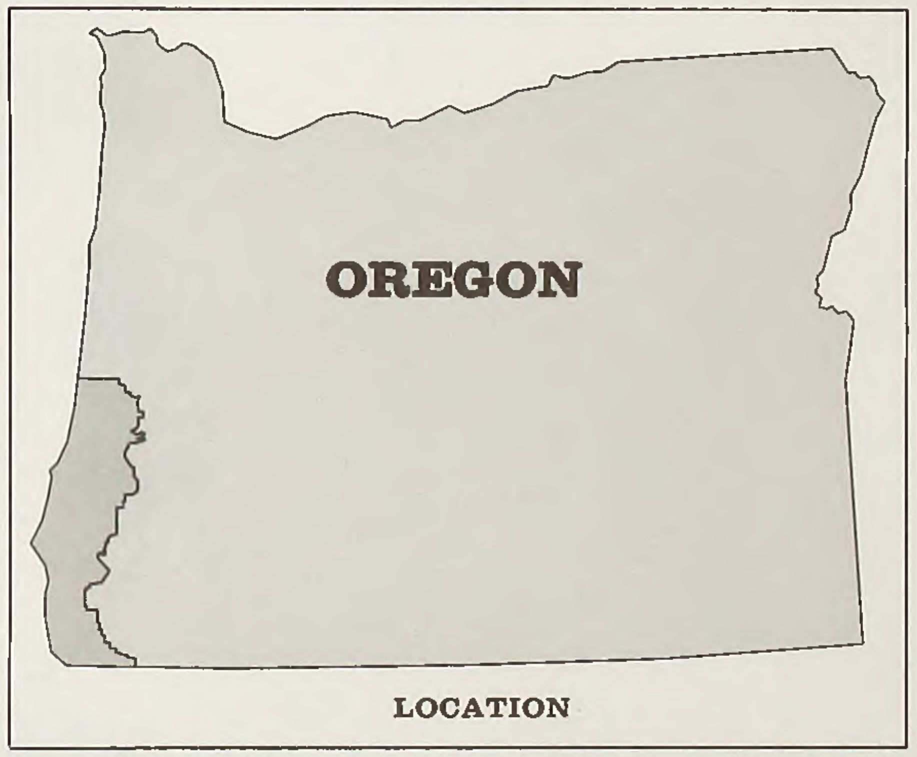
PREFERRED ALTERNATIVE

COOS BAY DISTRICT PLANNING AREA 1992 RMP/EIS





LOCATION

Note:

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LEGEND

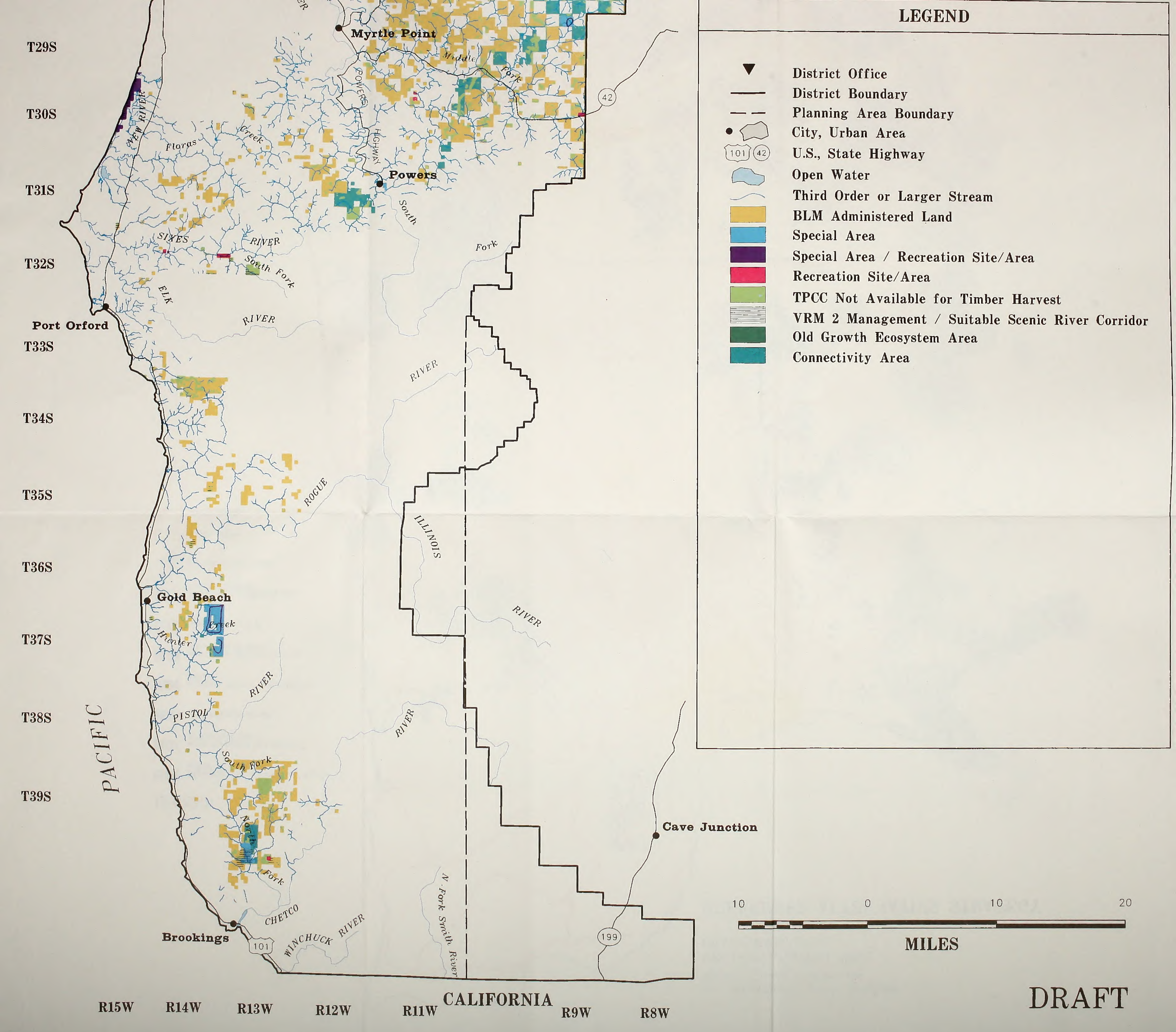
▼ District Office

— District Boundary

– – Planning Area Boundary

● City, Urban Area

(101) (42) U.S., State Highway


LEGEND
▼ District Office
District Boundary
Planning Area Boundary
City, Urban Area
101 42 U.S., State Highway
Open Water
Third Order or Larger Stream
BLM Administered Land
Special Area
Special Area / Recreation Site/Area
Recreation Site/Area
TPCC Not Available for Timber Harvest
VRM 2 Management / Suitable Scenic River Corridor
Old Growth Ecosystem Area
Connectivity Area
10
0
10
20
MILES
T29S
T30S
T31S
T32S
T33S
T34S
T35S
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R15W
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R9W
R8W
Myrtle Point
Middle Fork
42
POWERS
HIGHWAY
Powers
South
Fork
NEW RIVER
Floras Creek
SIXES RIVER
South Fork
ELK RIVER
Port Orford
RIVER
ROGUE
ILLINOIS
RIVER
Gold Beach
Hunter Creek
RIVER
PISTOL
RIVER
South Fork
North
Fork
CHETCO
Brookings
101
WINCHUCK RIVER
N. Fork Smith River
199
Cave Junction
PACIFIC
CALIFORNIA

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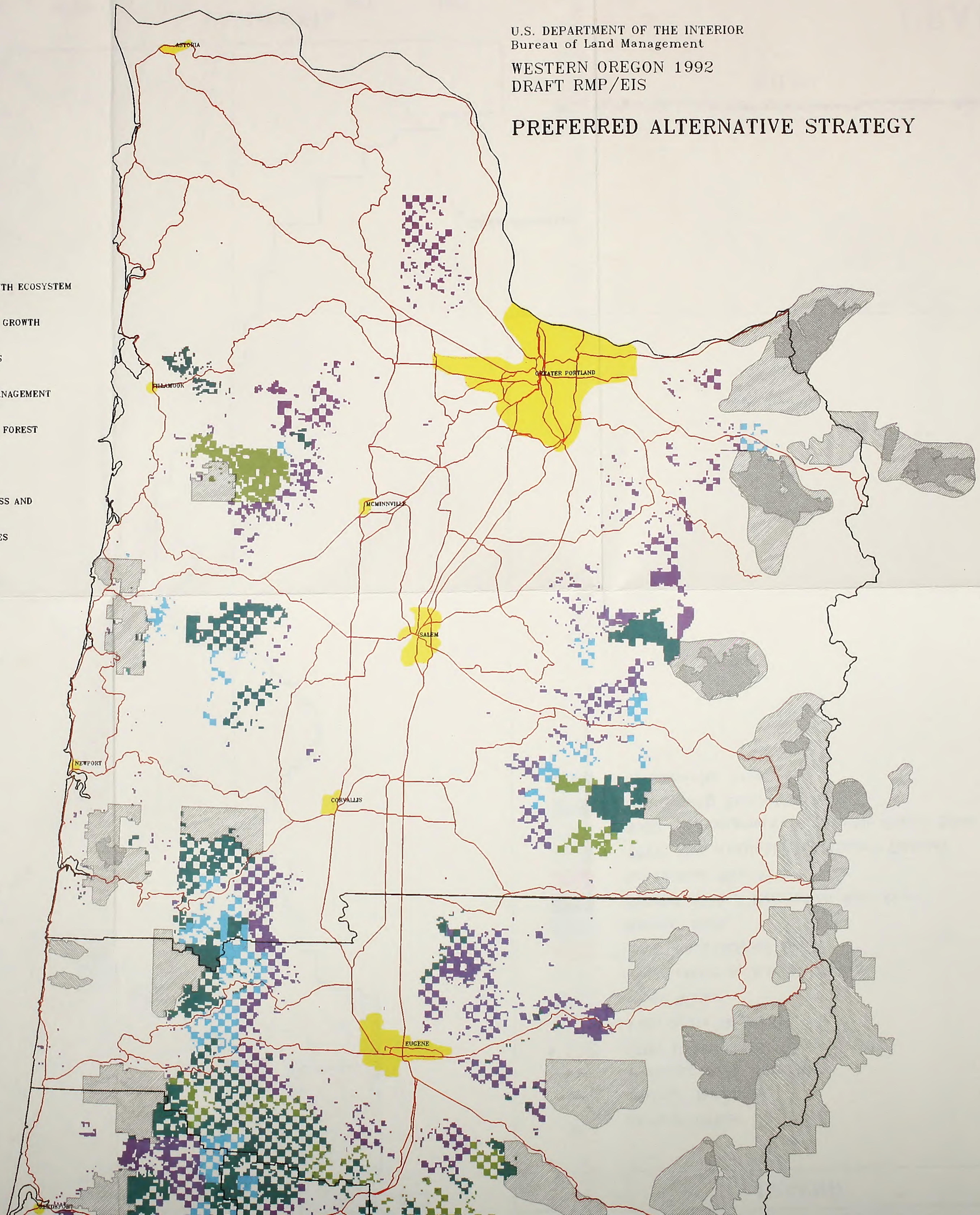
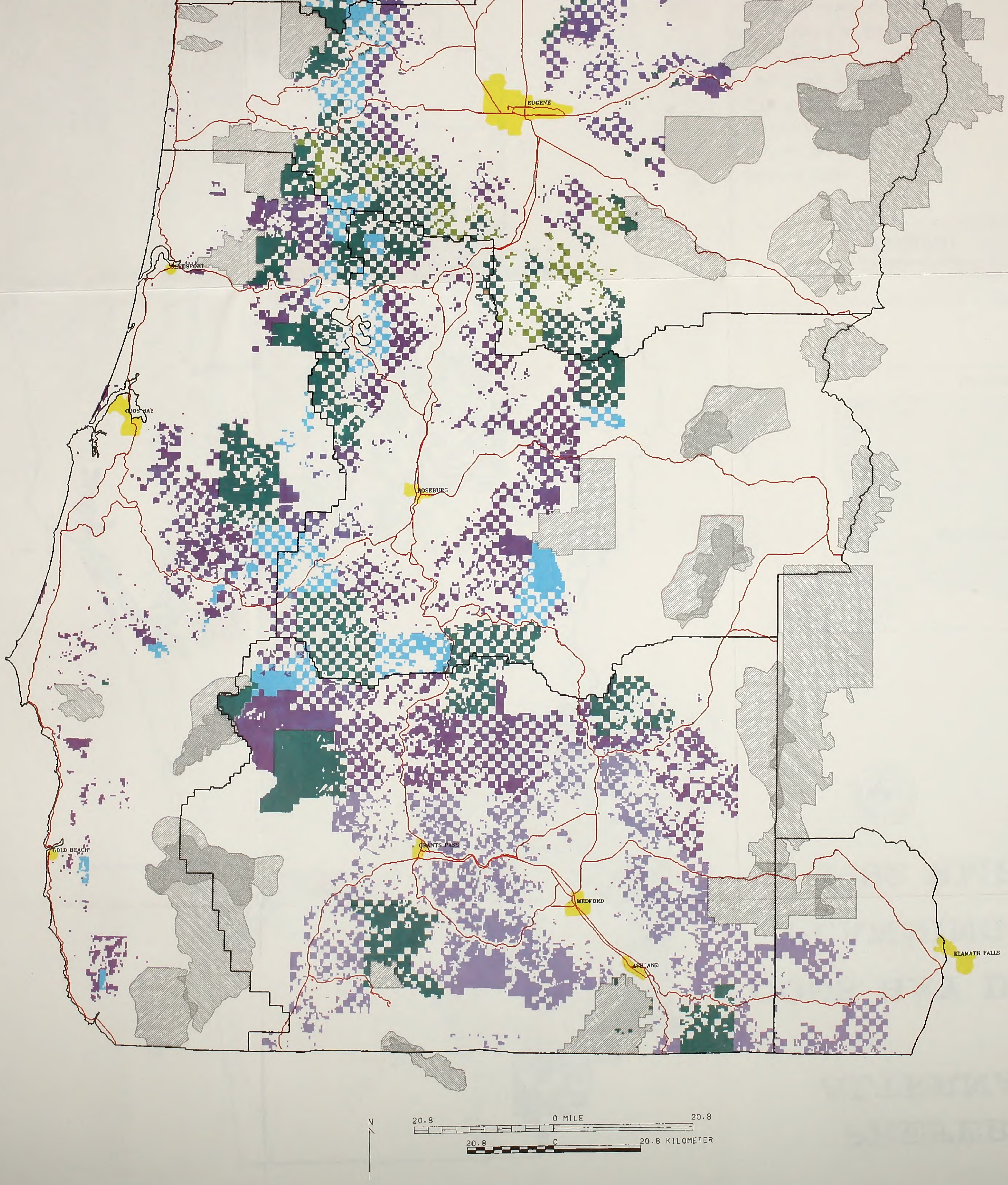


LEGEND :

- ▇ DEFERRED OLD GROWTH ECOSYSTEM AREAS
- ▇ NON-DEFERRED OLD GROWTH ECOSYSTEM AREAS
- ▇ CONNECTIVITY AREAS
- ▇ GENERAL FOREST MANAGEMENT AREAS
- ▇ SOUTHERN GENERAL FOREST MANAGEMENT AREAS
- ▨ USFS HCA'S 1 & 2
- ▨ NON-BLM WILDERNESS AND NATIONAL PARKS
- — DISTRICT BOUNDARIES
- ▇ MAJOR CITIES
- — MAJOR ROADS


EUGENE
REEDSPORT
COOS BAY
ROSEBURG
GOLD BEACH
GRANTS PASS
MEDFORD
ASHLAND
KLAMATH FALLS
N
20.8
0 MILE
20.8
20.8
0
20.8 KILOMETER

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